JUNE, 1951

MODERN Machine Shop

HERE'S THE TAP FOR HIGH PRODUCTION

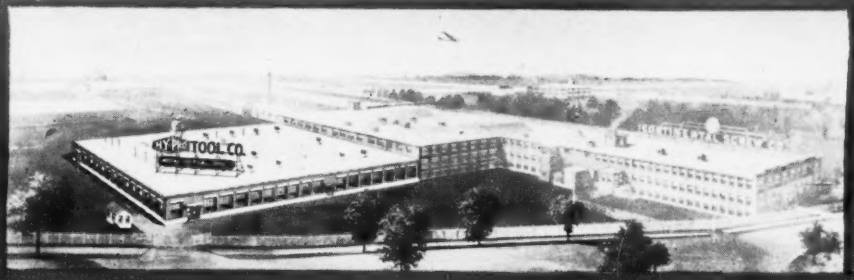
REG. U.S. PAT. OFF.
HY-PRO

TOUGH, ACCURATE TAPS

High Production on the toughest jobs! HY-PRO Taps maintain their original size longer to produce more accurately threaded holes per tap *in* mass production tapping or on exacting precision jobs.

Select your requirements from the full line of HY-PRO High Speed Ground Thread Taps stocked by your nearest HY-PRO distributor.

Call Your Distributor



COMMERCIAL • PRECISION
SPECIAL • High Speed Steel
GROUND THREAD TAPS

HY-PRO TOOL CO. New Bedford, Mass.
A Subsidiary of Continental Screw Co.

drudgery is OUT OF DATE

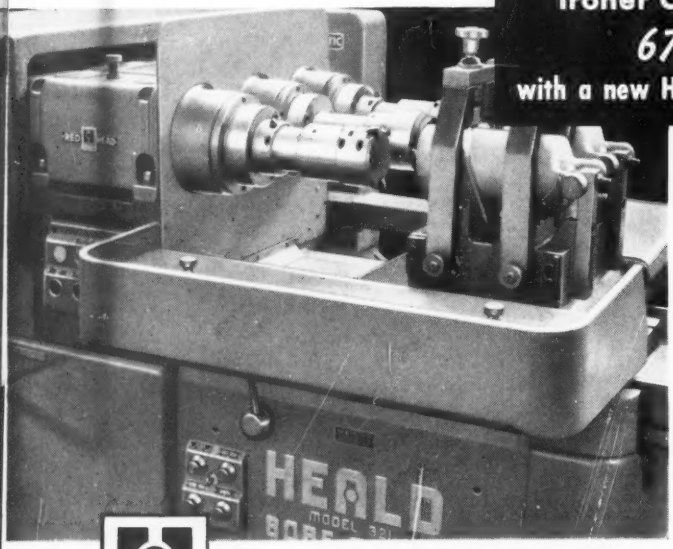
– because Heald Machines have smoothed the way to better production

● In yesterday's factories, precision and mass production were unheard of. But today, these same factors are essential elements of our modern industrial set-up. Let's take a look at just one, for instance.

The modern electric ironer — like so many other labor-saving household appliances — is made *better* and at *lower cost* because essential parts are finished on Heald machines. For Heald has consistently set the highest standards for quality, speed and economy in borizing, internal grinding and surface grinding.

Remember — when it comes to precision finishing, it pays to come to Heald.

Ironer Cylinders Produced *67% FASTER* with a new Heald Model 321 Bore-Matic



in this case HERE'S WHY

1. Automatic indexing — precision built cross slide indexes parts to provide multiplicity of operations without removing work.
2. Ease of operation — convenient control grouping, proper working height, push-button operation.
3. Faster machine cycle — rapid table traverse speeds output, reduces non-production time.

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

VOLUME 24 NUMBER 1
JUNE, 1951

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Published monthly and copyrighted (1951) by

GARDNER PUBLICATIONS, INC.
431 Main St., Cincinnati 2, Ohio

Printed in U. S. A.

Acceptance under Section 34.64, P. L. & R., Authorized

MODERN Machine Shop

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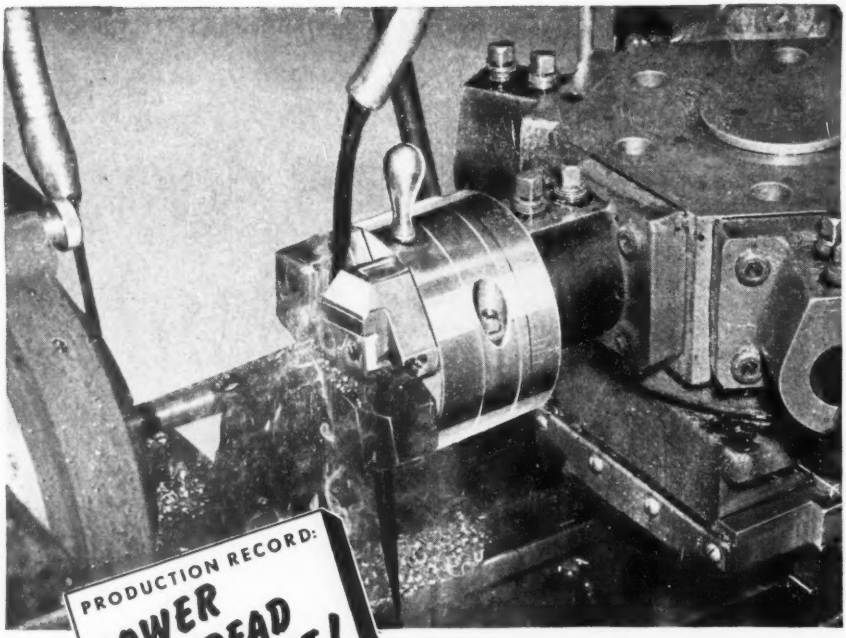


• Cut thread in only one pass.
• No hand fitting in assembly.

• Time Study and Methods Department records of a large aviation equipment company furnish data of another job where LANDMATIC Heads have effected large savings in machine time and improvements in product quality.

In this operation, the 1¼" LANDMATIC Head on a turret lathe equipped with Lead Screw Attachment is cutting a ⅝-6 Acme thread on a Stabilizer Screw used by a light aircraft manufacturer. The thread was held to the close tolerance of ± .001 between the P.D. of the thread and the O.D. of the screw, for a full thread length of 5⅜" on cold-drawn piston stock, Spec. No. AISI, B1112. The thread is now cut in one pass in .192 minutes with a spindle speed of 230 R.P.M., giving an average of 400 pieces per chaser grind. This is a saving of approximately 75%. Former methods required two passes—one roughing and one finishing cut—and hand fitting with the mating nut was necessary in assembly.

Write for Bulletins F-80 and F-90

LANDIS *Machine* CO. WAYNESBORO PENNA., U.S.A.

Hammond

OF KALAMAZOO

CARBIDE TOOL AND CHIP BREAKER GRINDERS

CB-77 Chip Breaker and Diamond Finishing Grinder

Save

TIME

TOOLS

WHEELS

WD-10 Wet or Dry 10" Carbide Tool Grinder

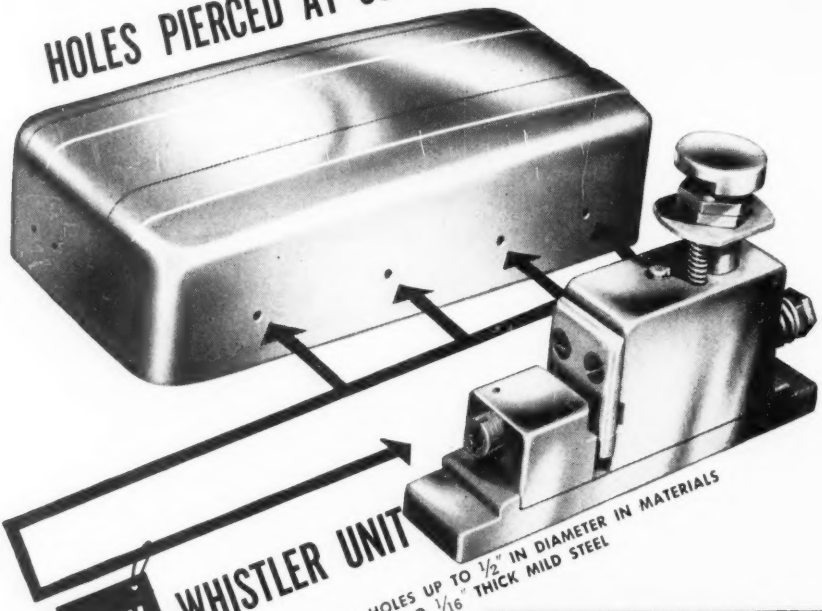
14-WD Wet or Dry 14" Carbide Tool Grinder

Hammond Carbide Tool Grinders will soon pay for themselves thru greater wheel economy, longer tool life and FASTER grinding. They relieve toolroom bottlenecks and step up production. **Write for Carbide Grinder Catalog**

Hammond Machinery Builders INC

1615 DOUGLAS AVE. • KALAMAZOO, MICH.

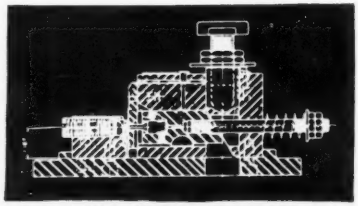
HOLES PIERCED AT 90° ANGLE...



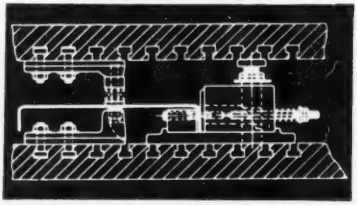
with NEW WHISTLER UNIT

PERFORATES HOLES UP TO ½" IN DIAMETER IN MATERIALS TO 1/16" THICK MILD STEEL

Extruded shapes, ells, angles and other molded, shaped or fabricated pieces are easily pierced from the side at 90° with HU-50 Perforating Units. Quickly set up and adjustable, these units may be used separately or with standard perforating equipment. The advantages provided by other Whistler Adjustable Dies are retained. Absolute accuracy is assured. Quick change-over of hole arrangements can be made... in many cases, on the press. Production economies and speeded up operating schedules are effected. Continued re-use of units in different groupings spreads initial cost. It makes sense to look into the use of Whistler Adjustable Dies for all perforating, notching, slitting or rounding operations.



Detailed drawing showing operation of HU-50 90° Perforating Unit.



Typical set-up shows 90° perforating unit operated in conjunction with standard perforating equipment.

DETAILS EXPLAINED IN CATALOG NO. 48

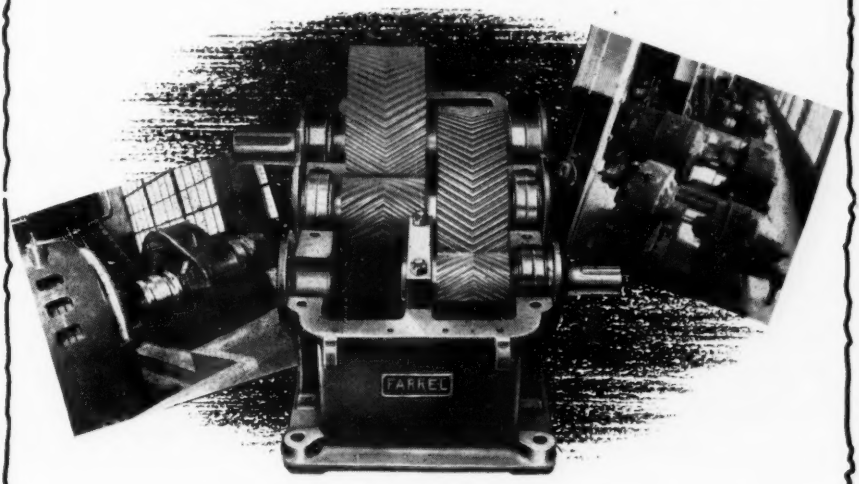
Get the facts about this 90° perforating unit in a hurry. Your copy of this catalog will be sent at once upon request.

S. B. WHISTLER & SONS, Inc.

740 Military Road • Buffalo 17, N. Y.

EACH FARREL SPEED REDUCER

has a special "aptitude" for its job



The design of Farrel speed reducers permits an engineering freedom in proportioning gears, shafts, bearings and even some housing dimensions to meet specific load, speed and service requirements. This flexibility has resulted in the solution of innumerable application problems.

In addition to this feature, Farrel speed reducers have a number of other advantages which help to account for their "aptitude" for handling tough assignments. The precision gears are generated by the famous Farrel-Sykes process for smooth, quiet, efficient operation; shafts and bearings are factored to safeguard against interruption of vital processes; gear cases are proportioned to withstand repeated heavy peak loads; joints are sealed to prevent entrance of dust and dirt.

Write for further details of these *problem-solving* units. Ask for a copy of Bulletin 449.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

FB-643

PICK 'EM RIGHT OUT OF THE BOOK

. . . and still get "something special"

H-W Straight Pipe Tap

H-W Taper Pipe Taps

Hanson-Whitney Pipe Taps

Yes, they're Standard (Taper, ⅛" to 2" and Straight, ⅛" to 1") . . . all ground with thread and shank finished after hardening.

Both Taper and Straight are available in right hand American Standard Pipe Form and American Standard Dryseal Pipe Form. Taper pipe taps are standard with both regular or interrupted threads.

For precision taper pipe threading to rigid Army-Navy Aeronautical Specifications, use H-W taps to do the job *right*, on a fast production basis.

Hanson-Whitney taps are produced on precision thread grinders designed and built in our own plant. Thus, controlled production, and checking with H-W Gages, assures you of a degree of quality unsurpassed.

SPECIAL PIPE TAPS...

. . . made to order with special tapers and/or threads per inch.

Also taper and straight pipe taps conforming strictly to Federal Standards for pipe couplings; grease cup, fuel, oil, and gas fittings; hose coulings and mechanical joints.

HANSON-WHITNEY COMPANY • HARTFORD 2, CONN.
DIVISION OF THE WHITNEY CHAIN COMPANY

Hanson Whitney
PIONEERS OF FINISHED TAPS

4HWB1

IS your Problem

ONE OF FORMS?

Try the

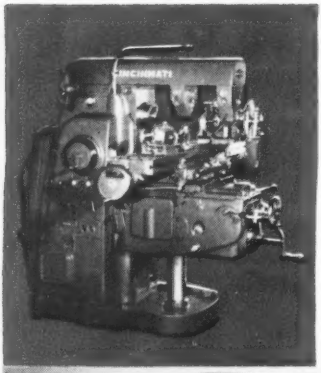
PEDRICK PRODUCTION BENDER

- The picture shows a Pedrick Bender making a 2-plane bend in a piece of square tubing with zero tangent between the bends. This was a production job with thousands of pieces to be made for a farm machinery company. It is only one of the many problems a Pedrick Bender handles quickly, accurately and economically. The same machine also bends pipes, strips and shapes with suitable dies and radius blocks.

Write for our descriptive folder.

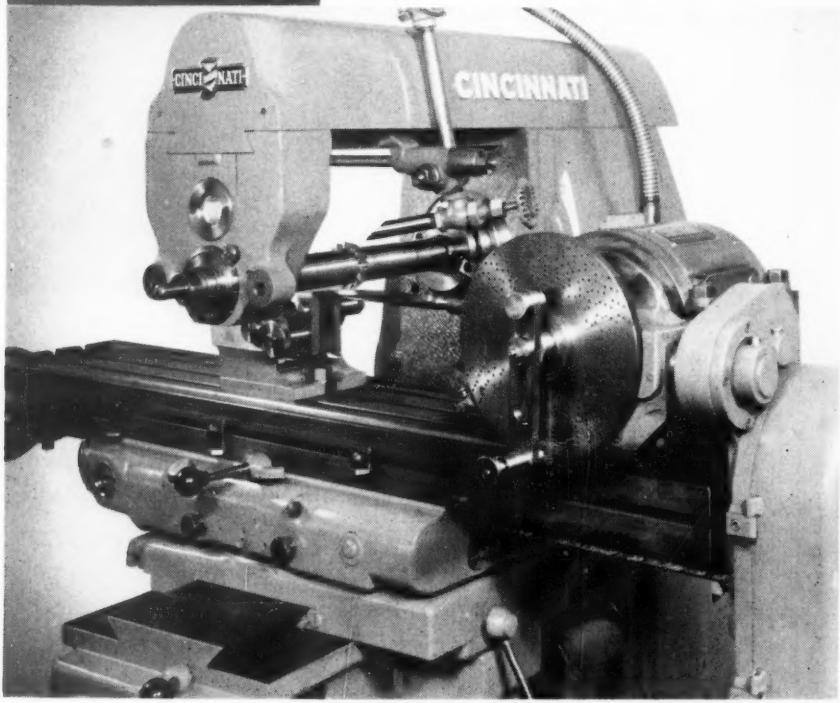
PEDRICK TOOL and MACHINE CO.

3640 N. LAWRENCE STREET **PHILADELPHIA 40, PA.**



CINCINNATI No. 2 MI Universal Milling Machine. Send for catalog No. M-1662. It contains complete data covering No. 2 MI plain, universal and vertical millers, and No. 2 ML plain and universal machines.

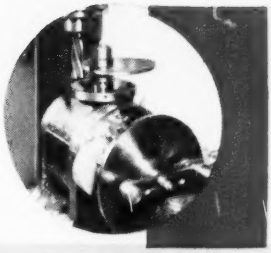
they take



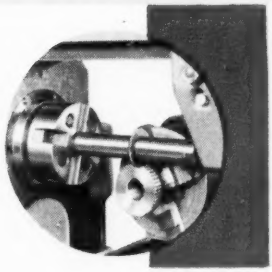
CINCINNATI No. 2 MI Universal Milling Machine set up to mill a tapered helical reamer having 5 flutes, left-hand helix, 26.88″ lead. Other types of setups assigned to these machines are illustrated on the opposite page.

CINCINNATI

CIN

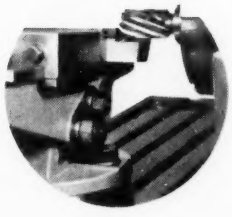


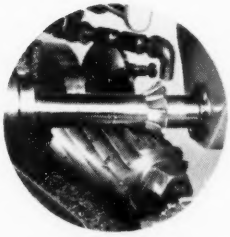
over a wide variety



# of toolroom milling

Almost any job is liable to pop up for a toolroom miller . . . an accurate spline shaft job, milling gear teeth, graduating a dial, milling the flutes in taper reamers, milling the angles on planer tools. All these jobs and many more, can be assigned to CINCINNATI No. 2 MI Milling Machines. ¶ As variety goes up costs go down, because: MI's have a spindle speed range of 25 to 1500 rpm, covering the requirements for cutters ranging from face mills to small boring tools. Feeds range from ¼" to 30" per minute. To facilitate the selection of the correct elements for efficient metal cutting, feeds and speeds are changed with single crank type controls. The Cincinnati Dividing Head supplied with universal millers has the desirable combination of rugged construction and the highest order of accuracy. Additional information may be obtained by writing for literature.





THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

TOP PERFORMANCE

For Less Money!

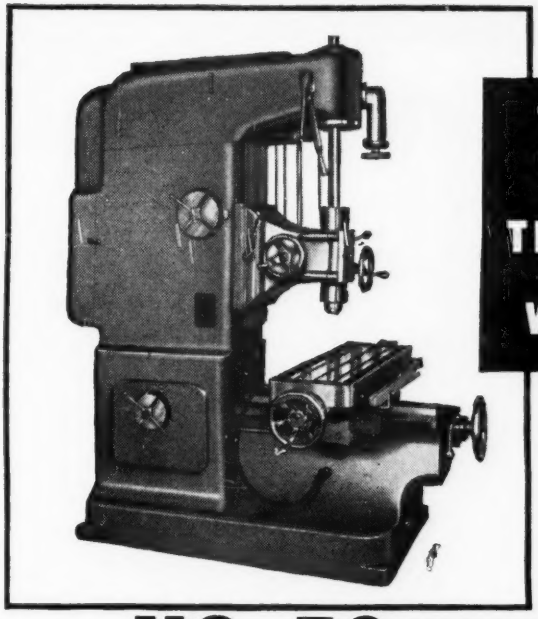
Handles work up to 1¼" O.D.

It's good judgment to tailor your tools to the job—especially when a large percentage of your centerless grinding work is of nominal size and can be done on an *economically priced* PROMATIC! You save a decided difference in original investment, you get the high production and necessary features of more costly machines . . . and the difference in first cost goes a long way toward buying *more* machines for *more* production!

Before you buy ANY centerless grinder get full information on PROMATIC. Built for precision at a big saving in original cost!

PROMATIC
CENTERLESS GRINDER

DIVERSIFIED METAL PRODUCTS CO.
5125 Alcoa Ave., Los Angeles 58, Calif.



1 MACHINE THAT DOES THE WORK OF 2

Sixteen Spindle speeds, 40 to 2000 r.p.m.—9 Spindle feeds, .005" to .010 —100" rapid traverse per minute in both directions—16 Table feeds, 5/16" to 20" per minute.

KNIGHT NO. 50 VERTICAL MILLING & PRECISION BORING MACHINE

✓ SAVES AT LEAST HALF THE SETUP TIME!
✓ ELIMINATES ALL WORK TRANSFERS
✓ SPEEDS UP OUTPUT—REDUCES UNIT COSTS

- **Fast, accurate, versatile, simple and easy to operate**
- **Handles an extreme range of difficult precision work**
- **Exceptional cross table travel — extra long spindle travel — complete selection of spindle and table speeds and feeds**
- **Rugged bed-type construction assures positive accuracy — 7½ h.p. motor and all-gear drive furnishes ample power for biggest, toughest jobs**
- **Convenient, quick-action controls — full vision work areas — easy setup — all save labor, eliminate lost motion, lower unit costs, boost production!**

Mail Coupon — Now!

W. B. KNIGHT
MACHINERY COMPANY

KNIGHT VERSATILE ACCURATE RIGID

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ST. LOUIS 8, MISSOURI

ATTACH TO COMPANY LETTERHEAD

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3920 West Pine, St. Louis 8, Mo.
Send catalog on No. 50 and other Knight Milling Machines.

NAME .....

TITLE .....

TOP PERFORMANCE

For Less Money!

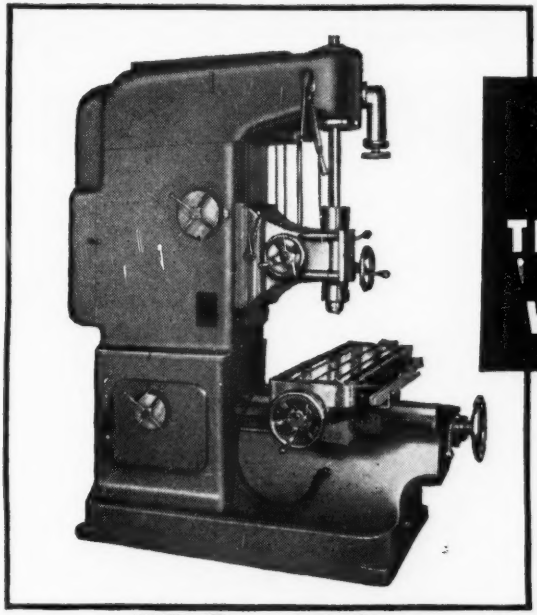
Handles work up to 1¼" O.D.

It's good judgment to tailor your tools to the job—especially when a large percentage of your centerless grinding work is of nominal size and can be done on an *economically priced* PROMATIC! You save a decided difference in original investment, you get the high production and necessary features of more costly machines . . . and the difference in first cost goes a long way toward buying *more* machines for *more* production!

Before you buy ANY centerless grinder get full information on PROMATIC. Built for precision at a big saving in original cost!

PROMATIC
CENTERLESS GRINDER

DIVERSIFIED METAL PRODUCTS CO.
5125 Alcoa Ave., Los Angeles 58, Calif.



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✓ SAVES AT LEAST HALF THE SETUP TIME!
✓ ELIMINATES ALL WORK TRANSFERS
✓ SPEEDS UP OUTPUT—REDUCES UNIT COSTS

- **Fast, accurate, versatile, simple and easy to operate**
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- **Exceptional cross table travel—extra long spindle travel—complete selection of spindle and table speeds and feeds**
- **Rugged bed-type construction assures positive accuracy—7½ h.p. motor and all-gear drive furnishes ample power for biggest, toughest jobs**
- **Convenient, quick-action controls—full vision work areas—easy setup—all save labor, eliminate lost motion, lower unit costs, boost production!**

Mail Coupon — Now!

W. B. KNIGHT
MACHINERY COMPANY

KNIGHT VERSATILE

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ST. LOUIS 8, MISSOURI

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Send catalog on No. 50 and other Knight Milling Machines.

NAME.....

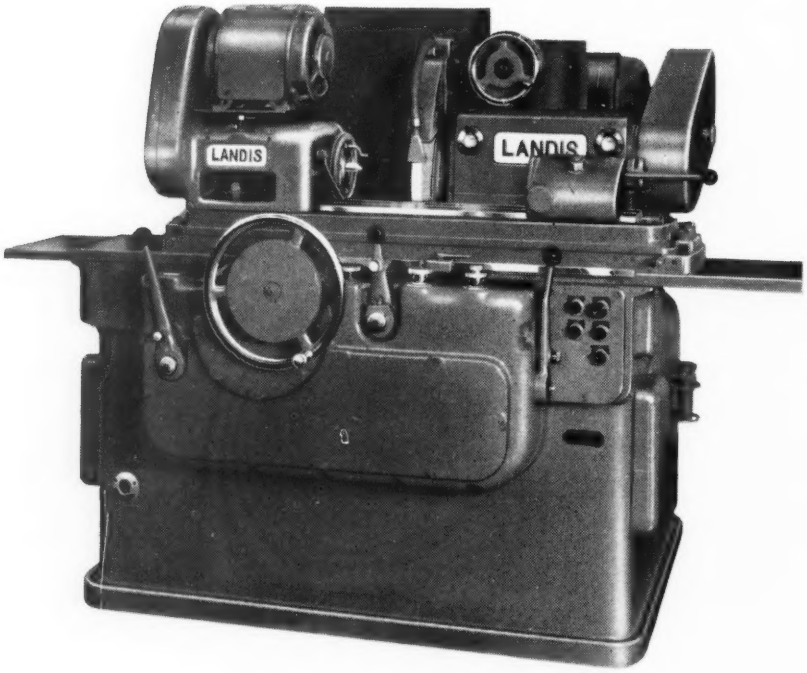
TITLE.....

25-30% OVER-ALL SAVINGS*

EQUIPPED WITH MICROSPHERE BEARINGS

by replacing obsolete grinder with

*** on all sizes of tap blanks ground. Specific information on one size shown on chart.**

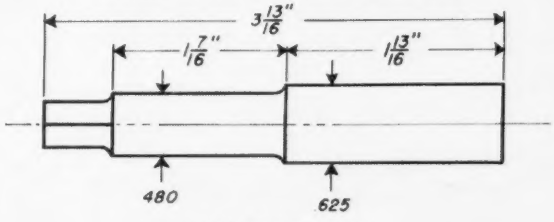


6" x 18" Type CH Plain Grinder.
Catalog B45

LANDIS TOOL
Precision Grinders

modern LANDIS TOOL precision grinder

6"X 18" TYPE CH PLAIN GRINDER



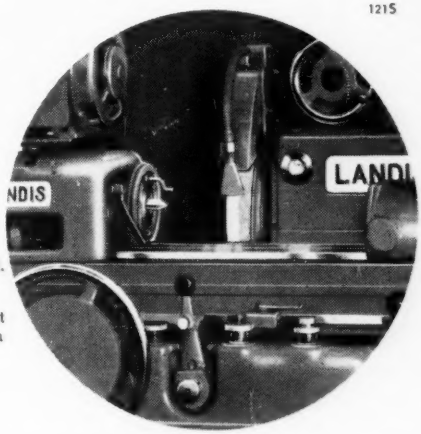
HAND TAP BLANK

PART	MACHINE	OPERATION	PRODUCTION
5/8" HAND TAP BLANK	LANDIS TOOL 6"X18" TYPE CH PLAIN	INFEED GRIND 480" OR .625" DIAMETER	400 FINISHED TAP BLANKS PER 8-HOUR DAY. TWO DIAMETERS.
MATERIAL	**STOCK REMOVED**	**LIMITS**	
HIGH SPEED STEEL	.012"	±.0005"	
METHOD		**FINISH**	
STRAIGHT INFEED		GOOD COMMERCIAL	

LANDIS TOOL COMPANY
WAYNESBORO, PA.
PRECISION GRINDING PRODUCTION RECORD 1036

Former production 280 complete tap blanks per 8-hour day.

1215



MODERN HIGH PRODUCTION FEATURES

6 x 18 Type CH Plain LANDIS TOOL Precision Grinder

Semi-Automatic Cycle

Hydraulic infeed—to speed operating cycle.

Hydraulic timer—for positive spark out period.

Footstock Mounted Dresser—convenient for frequent wheel dressing required when grinding high speed steel.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

"A Machine Designed with YOU in mind"

The FOSDICK Sensitive RADIAL

YOU the production men and operators who use our machines daily.

Yes, Fosdick engineers had YOU the operator and YOU the production man in mind when they designed so many work-saving, time-saving features into the FOSDICK Sensitive RADIAL.

Because of its high utility factor the FOSDICK Sensitive RADIAL fills the gap between the large Radial and the Sensitive and Upright Drills. It has the sturdy construction and flexibility of Radial design plus the high speed characteristics of the Sensitive Drill.

The heavy base construction—the one-piece column and the adjustable swinging table assure perfect rigidity for sensitive drilling and tapping operations. The arm is at fixed height within easy reach of the operator at all times. Both table and arm swing in an arc of 360°.

The functionally designed head has nine speeds and four feeds controlled by means of direct reading levers located at the operator's normal working position.

This work-saving, time-saving machine fits right into the production scheme of both large and small shops. Wherever there is a job requiring holes up to 1½" in diameter there is a definite need for the FOSDICK Sensitive RADIAL.

Consult a Fosdick Representative or Write for Bulletin S.R.M.M.S.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.

Finest for ACCURACY: Attaches firmly to drill press or tapping device.

Finest for VERSATILITY: Taps anything from soap to nickel steel without pressure on tap — prolongs tap life.

Finest for ADAPTABILITY: Five sizes, standard or built-in models, will fit any drill press or tapping device. 0-1½" cap.

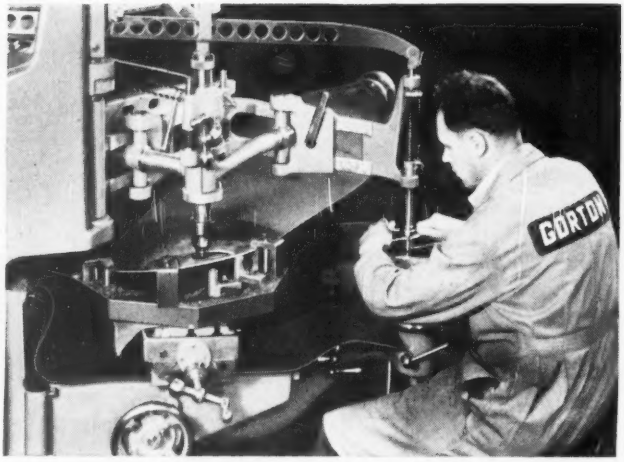
Finest for MAINTENANCE: Requires little or no maintenance.

TORQOMATICS, when used with Jarvis **TECNI-TAPS**, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Company, Middletown, Conn.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Special Machine Tools Speed Production During Rearmament

by
GEORGE GORTON III
Executive Vice-President,
George Gorton Machine Co.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

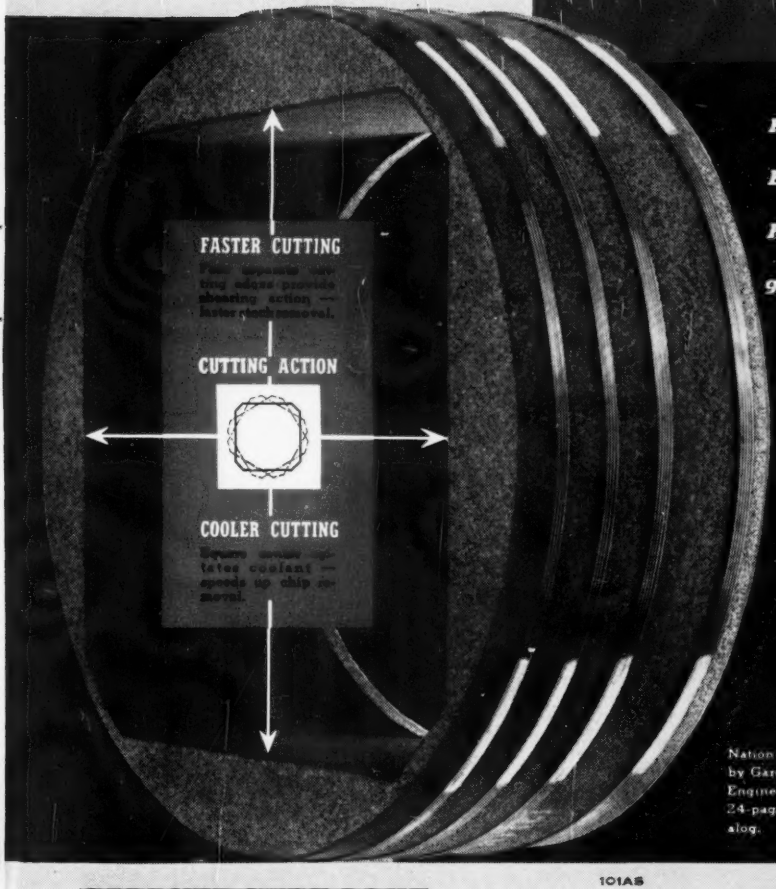
A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1706 Racine St., Racine, Wisconsin, U. S. A.

NEW SQUARE CENTER

Brings Flat Surface Grinding Costs Down

GARDNER

abrasive discs



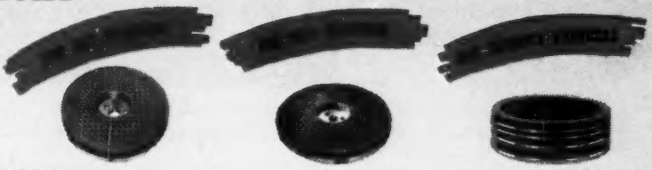
For Pratt & Whitney, Blanchard, and Hanchett type grinders

Nation-wide service by Gardner Abrasive Engineers. Request 24-page abrasive catalog.

101AS

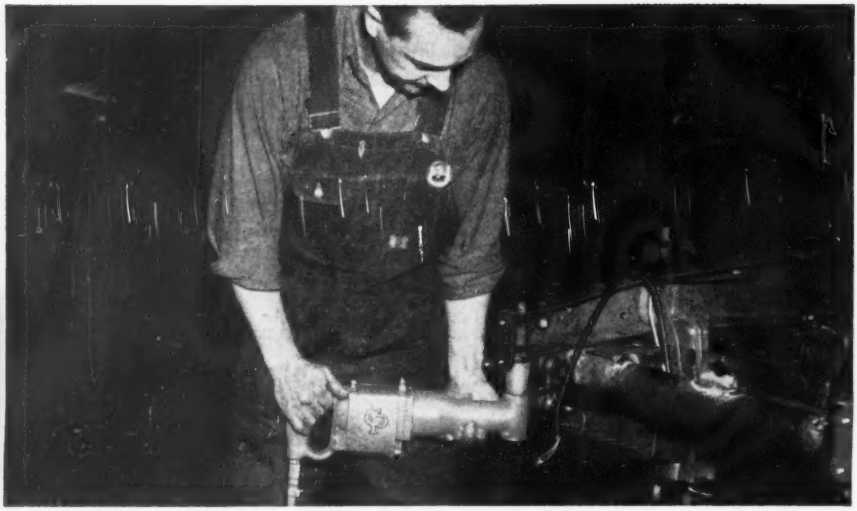
GARDNER WIRE-LOKT ABRASIVE DISCS

full range of types and sizes



GARDNER MACHINE COMPANY

428 Gardner Street • Beloit, Wis.



CUT DOWN nut-running time

on production line and maintenance jobs

A wrench for every requirement

Capacities—Bolt Size

CP-337	1/4"
CP-344	3/8"
CP-3440 (heavy)	3/8"
CP-349	5/8"
CP-360	3/4"
CP-3630 (heavy)	3/4"
CP-365	1 1/4"

CP Air Impact Wrenches are big time-savers on any nut-running job. They are the only complete line of impact wrenches with angle-head models in all sizes—to reach awkwardly located nuts, bolts and studs.

Power regulators assure uniform nut-running on production line work.

Available with side, pistol grip or straight handles, trigger or lever-type throttles, and angle heads for hard-to-reach nuts, bolts and studs.

Write for detailed information

CHICAGO PNEUMATIC TOOL COMPANY

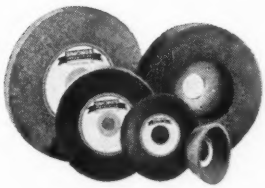
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

"Sitting Pretty"

SIMONDS ABRASIVE CO.

grinding wheels



Everyday's a holiday from grinding problems since he put Simonds Abrasive Company wheels to work. More production . . . fewer wheel dressings . . . and DO's out ahead of schedule. Why? Because all Simonds wheels are accurately specified . . . rigidly tested . . . and scientifically controlled in manufacture. Complete line includes grinding wheels, mounted wheels and points, segments and abrasive grain . . . all backed by Simonds' more than 50 years experience as a major manufacturer of grinding wheels. Write for free Data Book.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON DISTRIBUTORS IN PRINCIPAL CITIES

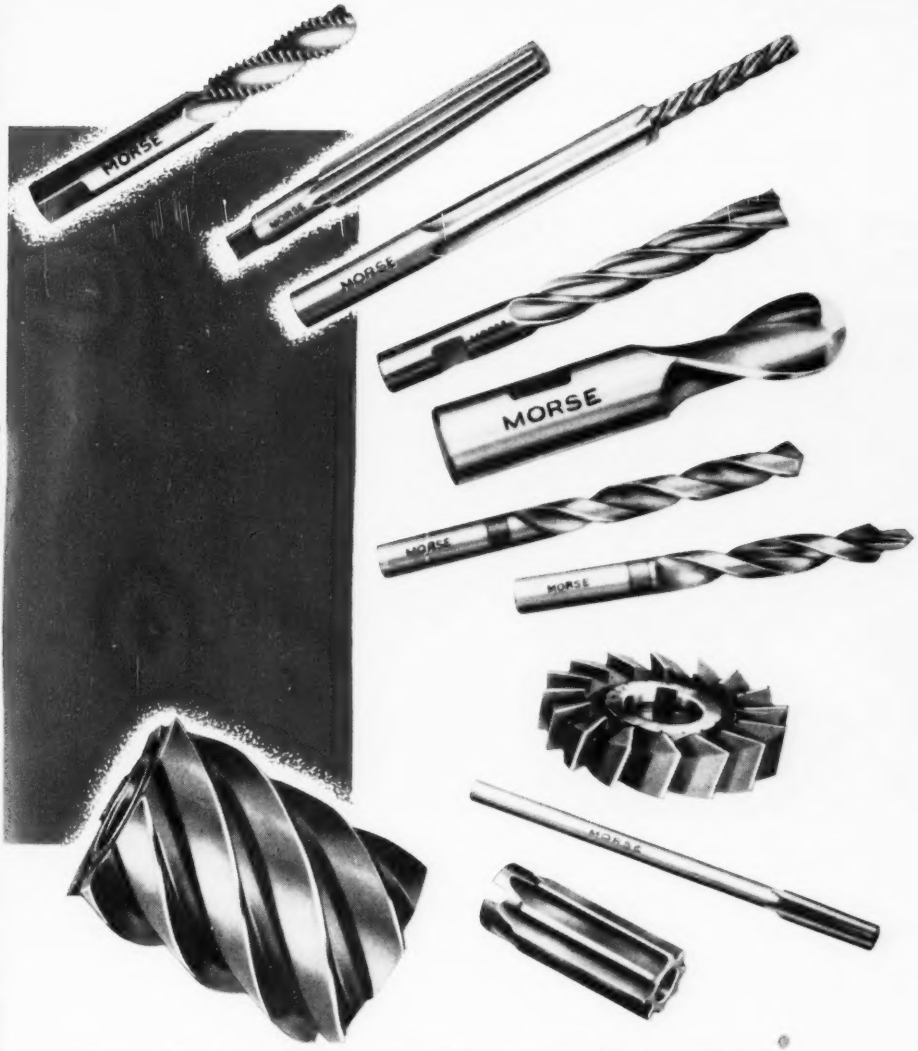
Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

...put MORSE TOOLS on every job!

When the chips are *up*, then you know that MORSE Cutting Tools are on the job . . . everywhere in your plant. For when the chips roll fast and free, there's no other answer. It's MORSE on the job . . . delivering *more* than any other tools you can buy . . . whether it be Drills, Reamers, Taps, Dies, Cutters, End Mills, or Specials.

Yes, if you want MORSE QUALITY . . . then you *hate* to buy MORSE TOOLS. And the only place *where* you can buy MORSE QUALITY is from your own MORSE-Franchised Distributor. He is well supplied. He can well supply *you*.

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, San Francisco



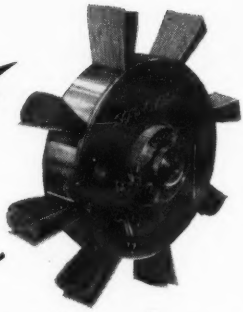
MORSE

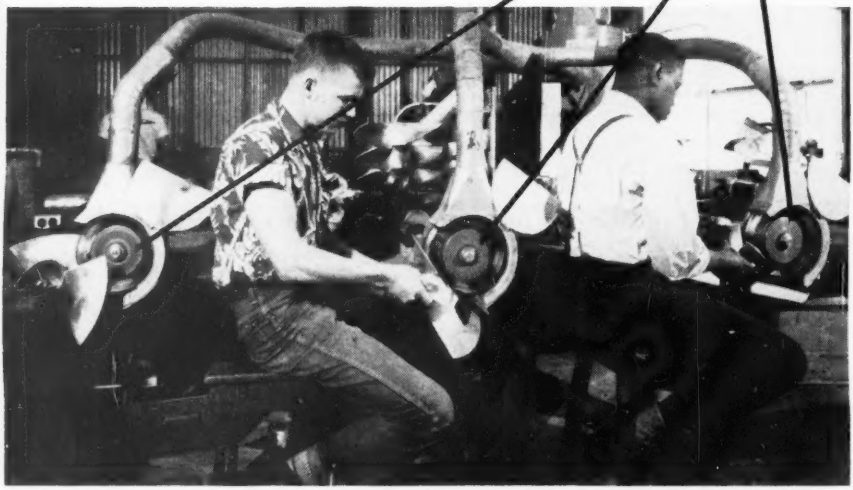
Cutting Tools

SAND-O-FLEX

Trade Mark Reg. U. S. Pat. Off.

does what no other sander can do!





These cast aluminum propellers used in aircraft heaters and blowers, made by Dynamic Air Engineering Inc., Los Angeles, require deburring and finishing to balance them and improve their efficiency. Of all the methods tried, Sand-O-Flex is the only sander that gets in and around the intricate shape of these props and eliminates the prohibitive cost of sanding them by hand.

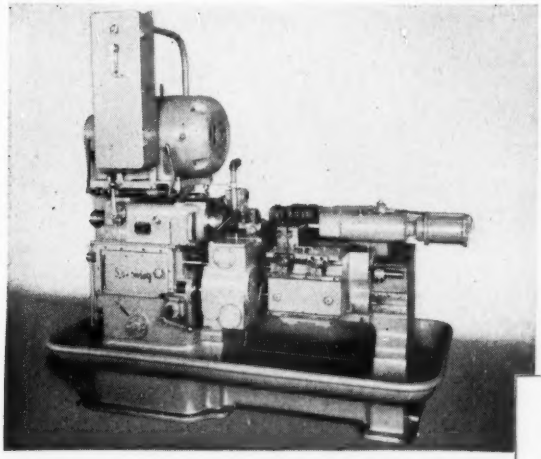
Sand-O-Flex has duplicated this story in thousands of metal working shops where contoured and irregular parts present a difficult sanding and deburring problem. Sand-O-Flex fits your present power tools—lathe, drill press, motor shaft, etc. Specially prepared abrasives supplied in many grits. Available in four sizes, for light-duty portable use to heavy production-line jobs. Cost is unbelievably low. See your dealer or write for free literature and prices.

MERIT PRODUCTS, Inc.

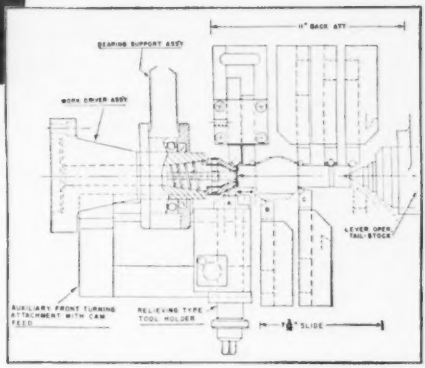
4023 Irving Place, Culver City, California

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



MODEL "LR" *Lo-swing* TURNS BOTH ENDS OF GEAR SHAFTS IN ONE OPERATION


BEARING SUPPORT ASSY
WORK DRIVER ASSY
LEVER OPER. TAIL-STOCK
AUXILIARY FRONT TURNING ATTACHMENT WITH CAM FEED
RELIEVING TYPE TOOL HOLDER

Problem: Turn, square and chamfer both ends of Gear Shafts in a single operation.

Solution: The Model "LR" Automatic *Lo-swing* Lathe selected for this job was equipped with one standard two-slide front turning carriage, one 11" wide back squaring attachment and one special auxiliary front turning attachment arranged for feeding towards the tailstock. Tools A-B and C, as shown in the line drawing, start cutting simultaneously. Tool A feeds in the direction of the tailstock to the position shown by dotted lines, and then returns to the starting position before tools B & C, which feed towards the headstock, reach the end of their cut. All shoulders are faced and chamfered and one diameter grooved immediately after the front tools have ceased cutting. All slide movements are cam operated and cannot get out of time.

A spindle extension which runs in its own bearing, provides sufficient space for the auxiliary front turning attachment. Note also the balanced driver with two tongues which fit into a groove in the end of the gear shaft providing an efficient method of driving the gear shaft.

Seneca Falls engineers welcome inquiries involving difficult and unusual machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

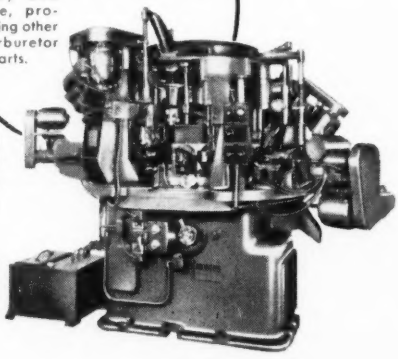
PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

The Car Buyer Profits from MORRIS *Engineered* PRODUCTION

Every owner of one of the most popular low-priced cars, saved money . . . because of this MOR-SPEED Production Machine. With it, one operator does the work formerly done by five machines and five operators. Seventeen drilling, 16 tapping, 2 reaming, 7 spot facing, 1 deburring and 2 radii forming operations are performed with a single loading . . . in a single machine cycle . . . at a 5 per minute rate!

Although your multiple drilling, tapping, reaming and similar operations may not be as complicated as this Morris installation, chances are Morris Engineers can show you *proof* of substantial savings. It costs you nothing to investigate. Write today.

This Morris Center Column Machine taps, drills and spot faces carburetor bodies with production of 320 pieces per hour at 80% efficiency. In the same plant, two other Morris Machines save time, money and space, producing other carburetor parts.



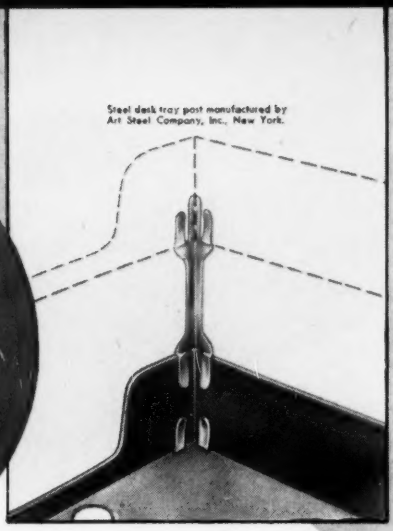
An informative article on automatic multiple machining tells more about this Morris MOR-SPEED installation. Write for free reprint.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Ask about the MOR-SPEED Line

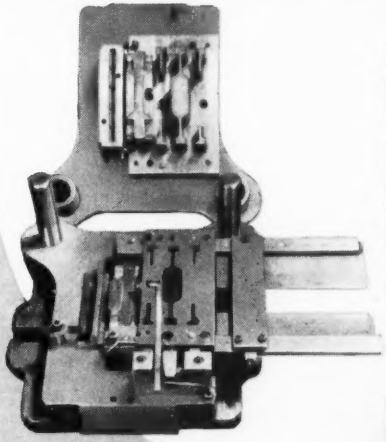
934 HARRIET STREET CINCINNATI 3, OHIO



Steel desk tray post manufactured by Art Steel Company, Inc., New York.

they built the die in a

DANLY DIE SET!



Dependable, long wearing dies are a must in stamping the desk tray posts shown above because of volume production requirements. The dies have to be sturdy, too, to withstand the combination of high speed operation and heavy stock.

That's why Art Steel Company, Inc., of New York, chose a Danly Die Set. Outstanding performance in jobs like this has made them the first choice of die makers everywhere. Just call your nearest Danly Branch Assembly Plant* for quick attention to *your* specific die set needs.

DANLY MACHINE SPECIALTIES, INC.

2100 South Lara[illegible] Avenue, Chicago 50, Illinois

PRECISION DIE SETS . . . STANDARD AND SPECIAL

***WHICH DANLY BRANCH IS CLOSEST TO YOU?**

Danly Branch Offices: *Chicago 50, 2100 South Laramie Avenue • *Cleveland 14, 1550 East 33rd St. • *Dayton 7, 3196 Delphos Ave. • *Detroit 16, 1549 Temple Avenue • *Grand Rapids, 313 Michigan Street N.W. • Indianapolis 4, 5 West 10th St. • *Long Island City 1, 47-28 37th St. • *Los Angeles 54, Ducommun Metals & Supply Co., 4890 South Alameda • Milwaukee 2, 111 East Wisconsin Ave. • Philadelphia 44, 18 W. Chelten Ave. • *Rochester 4, 16 Commercial St. *Indicates complete stock

DANLY

More than 25 years of dependable service to the stamping industry

"MARVEL" HAS always had the edge

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, come the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary high speed steel blades.

1. High Speed Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

ARMSTRONG-BLUM MFG. COMPANY

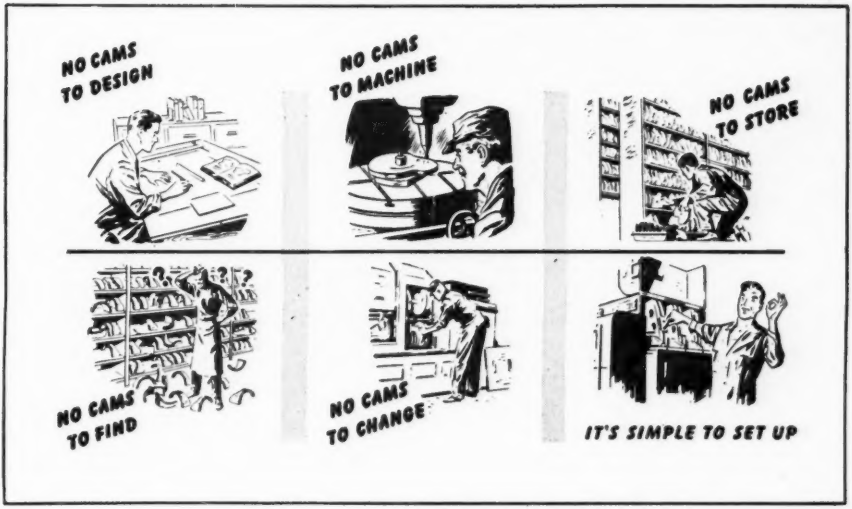
"The Hack Saw People"

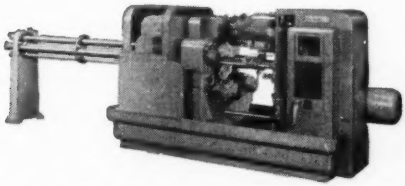
5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

MARVEL *Metal Cutting* SAWS

Better Machines—Better Blades

No cam worries with a Warner & Swasey 5-Spindle Automatic





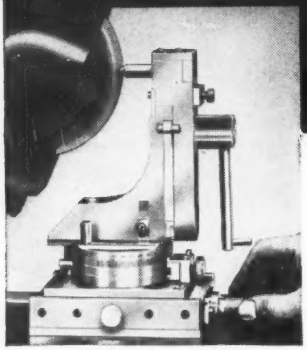
5-Spindle Bar Machines
—1¼" Standard Capacity
—2¼" Oversize Capacity
5-Spindle Chucking Machine—6" Swing

WARNER & SWASEY
Machine Tools
Cleveland

IT'S SIMPLER TO SET UP A WARNER & SWASEY CAMLESS AUTOMATIC!

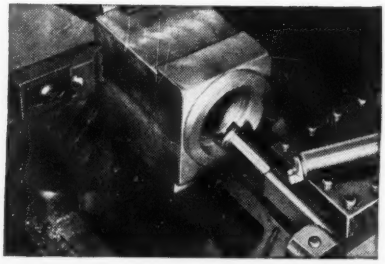
More Production per Man Hour

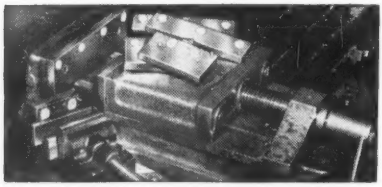
with Machine Shop TIME SAVERS by J&S



J & S "Fluidmotion" RADII and ANGLE DRESSERS dress entire angle-radius-angle profile **in one continuous motion**—with one easy set-up! Automatic centering, dustproof and chatterless, high-carbon, high-chrome steel construction. Dresses wheels up to 20" diameter—easily adaptable to all surface and cylindrical grinders, with J & S fixtures.

J & S KOALA "Circular" CUTTING TOOLS. New or re-sharpened cutters inserted in same shank **without re-setting** machine or stops—each accurately **repeats** original set-up position! **Easy** to re-grind, low-priced, simple. Major uses: Internal—boring, facing, threading, forming; External—turning, facing, forming, threading. Photo shows typical deep boring, boring and internal facing operation, external facing and turning. 12" Boring Bar removed to show carbide head after numerous re-grinds.





J & S "Down-Hold" VISE JAWS and "Attachable" PARALLELS, used with regular vises, save 25% to 75% on loading time! VISE JAWS force work-piece down—"stops" provide accurate position. **Eliminate** hammering, feeler gauges, allow repetitive operation. PARALLELS snap into place, are **forced down** so chips can't get under them. **Eliminate** wiping vise and parallels after each operation. Both Vise Jaws and Parallels easily attached to **any type** and size machine **vise.**

Also: J & S "All-Purpose" JAW CLAMPS (see center photo) for quicker set-ups, better grip; J & S Form Grinding Service ---special tools to specifications.

Write for Further Information

J&S TOOL CO., INC.

475 Main Street East Orange, N. J.

Representatives in Principal Cities

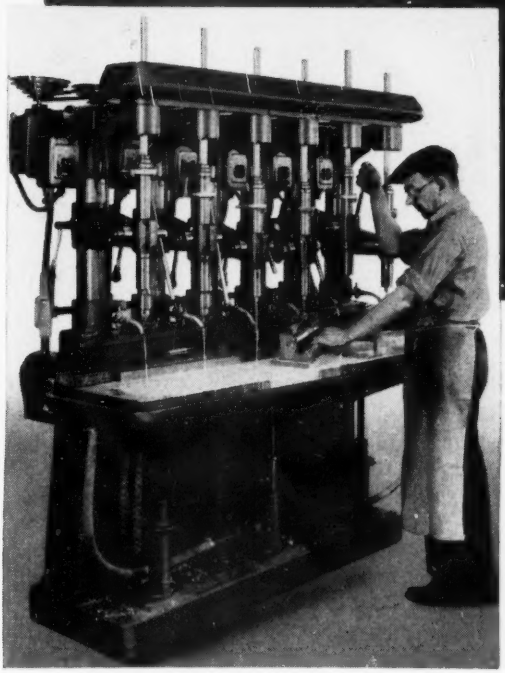
6 DRILLING, REAMING TAPPING OPERATIONS

— WITHOUT SETUP TIME LOSS! —

— WITH —

"Buffalo"

6-SPINDLE DRILLS



BUFFALO 6-SPINDLE No. 16 DRILLS

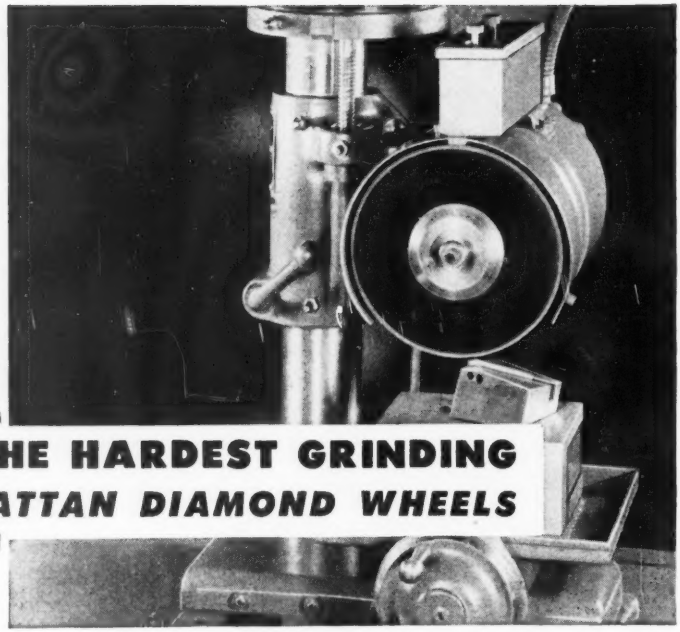
NOT — drill, change for reaming—ream, change for tapping — tap, then change to another size drill — with continual speed changes, tool changes and adjustments! BUT — set up two, three, four, five or six operations on this husky, accurate "Buffalo" Sensitive Sixteen, and watch production climb. Available in 8", 12" or 15" overhang, floor or bench models, also with coolant system, low speed and tapping attachment, if desired. Capacity up to 7/8". Precision built in all parts. WRITE FOR BULLETIN 2730-E.

BUFFALO "Buffalo" FORGE COMPANY

388 Broadway Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING



FOR THE HARDEST GRINDING
MANHATTAN DIAMOND WHEELS

Do Not Load or Glaze

"Best we've tried" say users who settle on Manhattan Diamond Wheels for grinding of carbides, or quartz and synthetic sapphire.

It's Manhattan's bonding that makes these wheels better. You can grind soft or hardened steel shanks in conjunction with grinding carbide inserts without loading or glazing the wheel. Manhattan Diamond Wheels need no dressing. They are unexcelled for economy and precision on surface, cylindrical or internal operations. Try them . . . write to

DIAMOND WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION
RAYBESTOS-MANHATTAN, INC. • PASSAIC, N. J.

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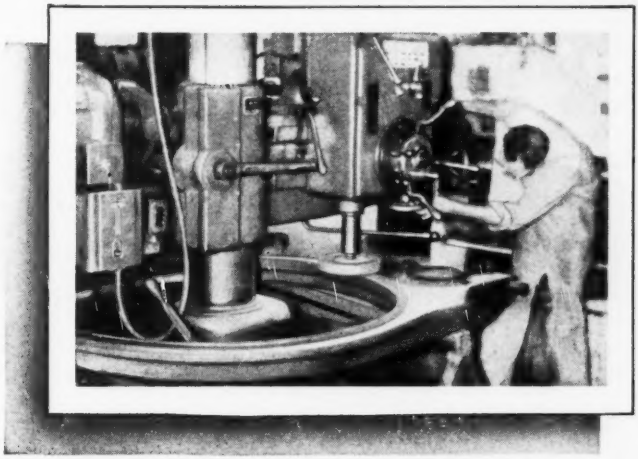
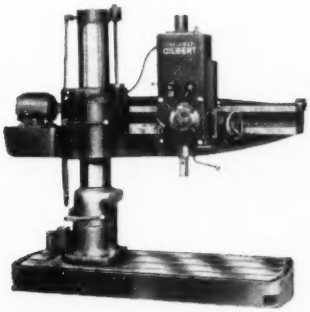


"never tell 'em it can't be done."

At the James Machine Works, Monroe, Louisiana, they have a reputation for never telling a customer "it can't be done." They've earned it with good tools, plus ingenuity. Here's one example—a 60" diameter swing check valve seat, built up by welding, was to be faced smooth and flat. Lugs on the casting ruled out their boring mill. H. M. James wrote us how the job was done. They placed the valve over a Cincinnati Gilbert radial, made a spindle adapter for a 12" cup-type wheel . . . then ground the face by swinging the Gilbert arm 'round and 'round, feeding the grinding wheel downward. Result: a good job and a happy customer.



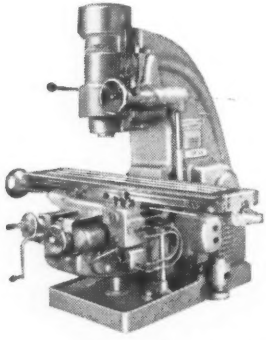
An unusual job, if you please, and an unusual demonstration of Gilbert radials' overall rigidity and precision *throughout a full 360° swing*. No wonder Gilbert users keep coming back again and again with repeat orders. Write for Bulletin 349.

THE CINCINNATI
GILBERT
MACHINE TOOL COMPANY
3366 BEEKMAN ST. • CINCINNATI 23, OHIO

THOSE WHO BUY GILBERT BUY GILBERT AGAIN

ANNOUNCING

The Addition of Vertical Style Milling Machines to the New KEARNEY & TRECKER MILWAUKEE CK Line



Kearney & Trecker's new CK line of Knee-Type Milling Machines is complete with Plain, Universal and now — Vertical styles. These new Vertical CK's have every feature of the CK line. Features that are job and test-proven — designed to fill today's immediate needs — and to meet your tomorrow's milling requirements. You'll find they have all the new CK cost-cutting advantages — Greater Rigidity, Greater Horsepower, Greater Cutting Efficiency, Greater Productivity, Greater Versatility, Smoother Feed Performance and Greater Machine Life. If you need a new vertical style knee-type mill—don't fail to investigate these new CK's. For without reservation, the new CK line of knee-type milling machines — Plain, Universal and Vertical — are the finest Kearney & Trecker has ever offered to the metalworking industry. Your choice of five sizes — 10 hp No. 2, 15 hp No. 3, and 25 hp Nos. 4, 5 and 6. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

REPLACEMENT OF OBSOLETE MACHINE TOOLS
IS AN INVESTMENT THAT MAKES BOTH DOLLARS AND SENSE

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

Belt Sanders

Bench Grinders

Drills

Drill Stands

Fender Hammers

Grinders

Electric Hammers

Impact Wrenches

Nibbler

Nut Setters

Polishers

Sanders

Saws

Screw Drivers

Tappers

Valve Refacers

Valve Reseaters

Air Tool Kits

Thor

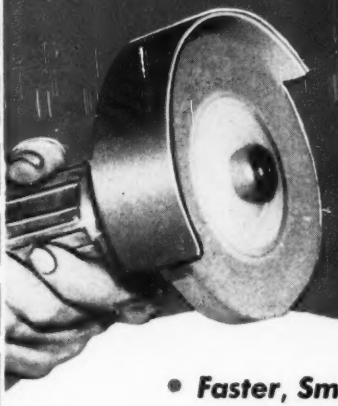
PORTABLE ELECTRIC

GRINDERS

WITH

SHOCK ABSORBER

SPINDLE



Reduces vibration on working parts—provides longer motor and gear life.

- *Faster, Smoother Grinding*
- *Easier on Operator*
- *Protects Motor and Gears*

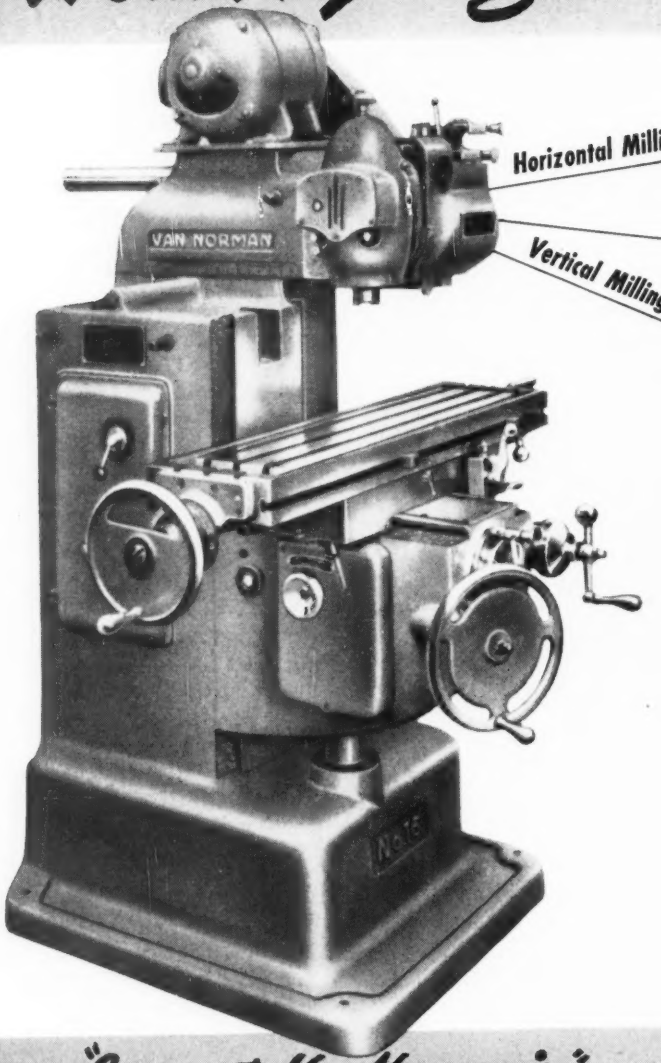
For faster, smoother grinding choose Thor Silver Line portable electric grinders. Available in 4", 5" and 6" models, Thor grinders are designed for hard use and steady service. Unsurpassed for any grinding, buffing, burnishing, wire brushing or cleaning job. Consult a Thor service engineer for correct tool selection to suit your grinding needs. Independent Pneumatic Tool Co., Aurora, Ill.

Write for new E-2 universal electric tool catalog

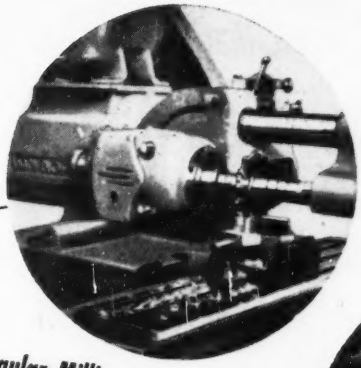
Thor PORTABLE POWER TOOLS

ASK FOR THE *Silver Line*

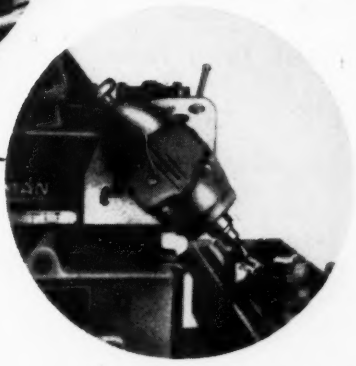
From Any Angle . . .

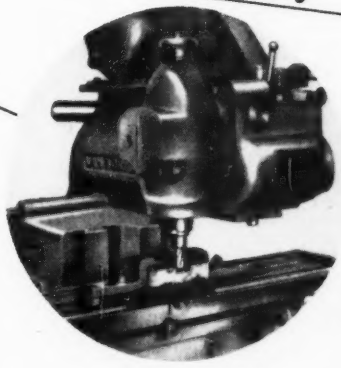


"It pays to Van Normanize"



Angular Milling





VAN NORMAN

NO. 16 RAM TYPE MILLING MACHINES INCREASE PRODUCTIVITY

This Van Norman No. 16 Miller gives you many outstanding and exclusive advantages that assure more workability for your plant.

The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The moveable ram plus the saddle cross feed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease. Single lever built-in electrical control simplifies operation. Spindle speeds from 95 to 2,000 rpm give you the right speed for every type of cut. Add such construction features as hardened alloy steel gears, large hardened alloy steel multi-splined shafts, precision-ground feed screws, one-shot metered lubrication and you have a milling machine that provides greatest productivity, lowest cost milling and long operating life.

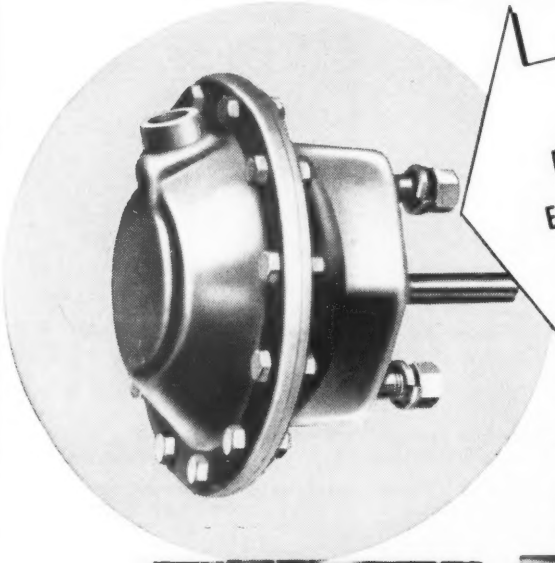
Write for bulletin, today

VAN NORMAN COMPANY
Springfield 7, Massachusetts

Modernize Even Your Latest Machine Tool Operations with

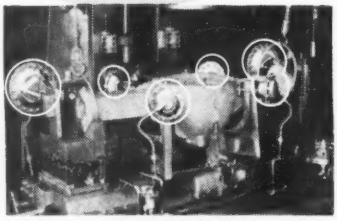
ROBOTAIR

THE INDUSTRIAL AIR CONTROL OF A THOUSAND USES



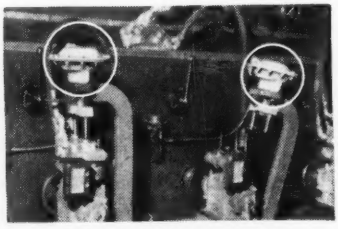
THIS SIMPLE, RUGGED, LOW COST, EASILY INSTALLED UNIT DOES THE JOB

A rugged air chamber for use wherever a short powerful stroke is needed for holding, positioning or clamping. Built in six different sizes with strokes from 1¾" to 3". Smaller diameter ROTO-CHAMBER available providing longer stroke. Your present air supply will be adequate for either.



SAVES MONEY

Savings realized on this operation for manufacturing axle housings by replacing hand screws and clamps with Robotair Chambers *amounted to hundreds of dollars.*



CUTS HANDLING TIME

Before installation of Robotair on this compressor run-in test line, compressors were held in position by manually operated clamps. Simple adaptation of Robotair Chambers and two-way valves *cut handling time in half.*

. . . AND STEP UP YOUR PRODUCTION AS MUCH AS 30% WITHOUT ADDING MANPOWER!

Amazing Savings in Time, Money and Effort!

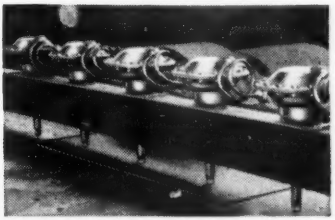
Bendix-Westinghouse, world's largest source of air brakes and other air devices, put more than a quarter century of experience behind the development and perfection of Robotair Industrial Controls. Ideal for holding, clamping, bending, swedging, staking, riveting and compactly designed for easy installation, Robotair Controls assure lower manufacturing costs per unit through increased productivity of man and machine at *unbelievably low initial cost.* Rugged, frictionless, leakproof construction eliminates need of oilers and filters and assures millions of strokes at *100% efficiency for total life.* Robotair units are available as original equipment for machinery manufacturers or for installation on present shop equipment. Send for your copy of the Robotair booklet today.

*Industrial Distributors in all Major Cities

Bendix-Westinghouse

Bendix-Westinghouse Automotive Air Brake Company • Elyria, Ohio

BENDIX-WESTINGHOUSE ROBOTAIR



REDUCES OPERATOR FATIGUE

Various sizes of steel plates are held in position by series of Robotair Chambers in this end grinding operation. Use of Robotair eliminated battery of hold down bolts and clamps greatly reducing operator fatigue.

BENDIX-WESTINGHOUSE
Automotive Air Brake Co.
Elyria, Ohio **Dept. F**

Please send me your free booklet on "Robotair—the Industrial Air Control of a Thousand Uses."

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TITLE_____

COMPANY_____

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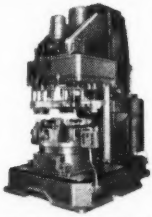
NATCO OFFERS

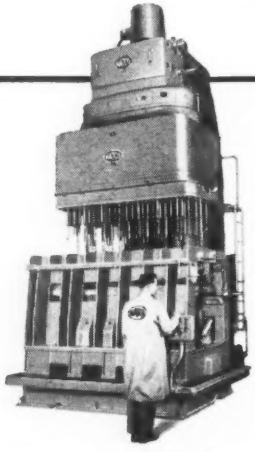
50 Years Experience

IN BUILDING A COMPLETE
RANGE OF DRILLERS, BORERS,
FACERS AND TAPPERS

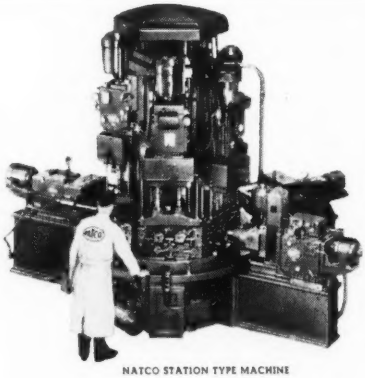
NATCO LIGHT SENSITIVE
DRILLER AND TAPPER



NATCO HOLESTEEL ADJUSTABLE
DRILLER AND TAPPER



NATCO HEAVY DUTY HOLESTEEL DRILLER



NATCO STATION TYPE MACHINE

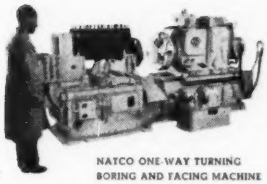
Out of the past fifty years of NATCO experience has come a deeper understanding of today's engineering and production problems. By reason of this maturity of understanding the NATCO organization is better equipped to help you solve your drilling, boring, tapping and facing problems. Better equipped with experienced engineers and designers. Better equipped with the most complete range of adjustable and fixed center multi-spindle machines in the world.

A few of the various NATCO machines are illustrated above. As you can see they range from small, fast, light-sensitive multi-drillers and tappers to large automatic processing machines from single spindle to an unlimited number of spindles, from one direction to any number of directions, vertical, horizontal or angular, special or standard and operations range from 1/16" drill to 14" or larger bore. The materials worked include iron, steel, bronze, aluminum, wood and plastic.

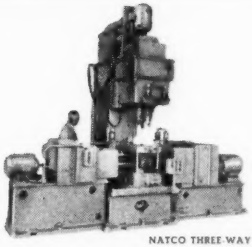
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

NATCO HIGH SPEED SENSITIVE DRILLER AND TAPPER

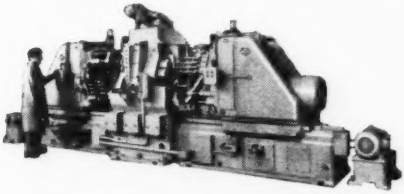
NATCO HIGH SPEED SENSITIVE UNIT



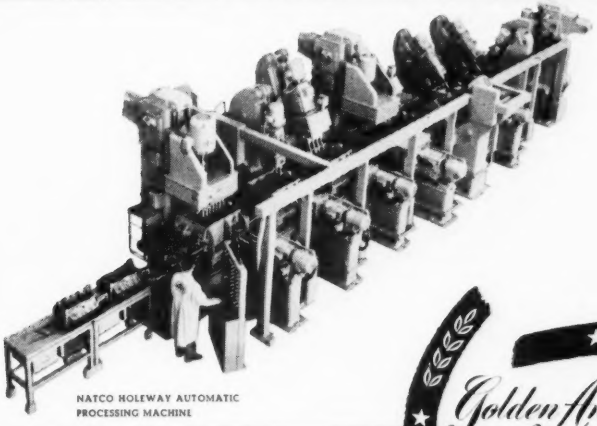
NATCO ONE-WAY TURNING BORING AND FACING MACHINE



NATCO THREE-WAY TAPPER WITH INDIVIDUAL LEAD SCREW



NATCO THREE-WAY TRUNNION TYPE DRILLING MACHINE



NATCO HOLEWAY AUTOMATIC PROCESSING MACHINE

Golden Anniversary

1901 NATCO 1951

Today NATCO offers you not only fifty years experience and ample production facilities but also several branch offices conveniently located to serve you in Detroit, Chicago, Buffalo and New York City

To solve your problems in drilling, boring, facing and tapping most economically . . . Call a NATCO Field Engineer Today!

Branch Offices

1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit
1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Ex
THAT
WHITMAN & BARNES

perience

PREFERS THE TOOLS EXPERIENCE PRODUCES

The name WHITMAN & BARNES, as it penetrated through industry during the past century, became singularly identified with a quality upon which users place a high value. The regard with which W&B tools are held necessitates a steady flow of these tools into an exceptionally varied and large group of industries.

Today—our facilities for manufacturing drills, reamers and our other products, are better than at any time in our long history. This has resulted because of our new, modern plant with capacity for greatly increased production. Each department is equipped throughout with the most modern facilities for maintained quality products. Department heads and production managers, with long service records, are thoroughly experienced, as are the men at the machines.

WHITMAN & BARNES tools are obtainable from Mill Supply Distributors everywhere.

Contact your local distributor.

WHITMAN & BARNES PRODUCTS INCLUDE:
High Speed and Carbon Steel Drills, Reamers, Counterbores, Lathe Centers, Arbors, Screw Extractors, Sockets and Sleeves, Interchangeable Punches, Carbide Tipped Tools, Special Tools.

W&B

"Makers of Fine Tools Since 1848"

PLYMOUTH, MICHIGAN NEW YORK • CHICAGO LOS ANGELES • HOUSTON

NOW AVAILABLE FROM U. S. STOCKS

122 lb. Swiss precision machine for automatic production of parts containable in a half-inch cylinder

Good for tolerances of half a tenth

S A F A G

No. 118 Type 1A—Automatic Wheel, Pinion and Segment Cutting Machine

SEE IT AT THE HIRSCHMANN SHOWROOMS · LITERATURE ON REQUEST

FACTORY SERVICE AND PARTS FROM MANHASSET, N. Y.

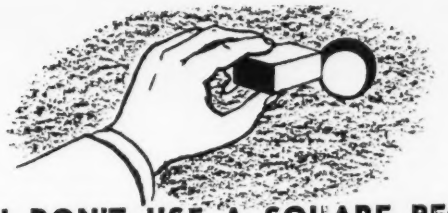
CARL HIRSCHMANN CO.

affiliated with **Hauser Machine Tool Corp.**
30 Park Avenue, Manhasset, N.Y.
Representatives in Principal Cities

EXCLUSIVE U.S. AGENTS FOR TORNOS WORKS, LTD.; SCHAUBLIN, S.A.; LAMBERT, S.A.; SAFAG, S.A.; AND AGATHON, LTD.

At 30 Park Avenue, Manhasset, N. Y., is the widest selection of Swiss precision machine tools available from any one address in the United States. Offered here by Carl Hirschmann Co. are Tornos Screw Machines and Cam Making Machinery, Schaublin Lathes, Collets, Milling Machines and Drilling and Tapping Machines, Lambert Gear Generating Machines and Thread Cutting Machines; Safag Automatics for Wheel and Pinion Cutting, Form Cutter Milling, and Cutter Backing Off, and Agathon Grinders and Die Sets. Offered by Hauser Machine Tool Corp. are Hauser Jig Borers, Jig Grinders, Optical Measuring Machines, Profile Projectors and Burnishing Machines.

SWISS *PRECISION CRAFTSMANSHIP* **SWISS** *DEPENDABILITY ACCURACY*



YOU DON'T USE A SQUARE PEG . . . IN A ROUND HOLE!

BE JUST AS WISE IN YOUR SELECTION OF FINISHING FILES

Enjoy the obvious advantages of using just the right size and shape oilstone file on your work. There are over 200 different sizes, shapes, and grits of NORTON Abrasive stone files to choose from. Smooth-cutting INDIA® or HARD ARKANSAS* Stone files are just the thing for fitting a die, deburring a machine part or putting that final, keen edge on a cutting tool.

They're an economical, long-term investment too, because INDIA and HARD ARKANSAS oilstone files are ALL file — not just a surface arrangement of cutting teeth that soon wear out! *They're good to the last grit!*

This handy folder is a MUST for any shop — shows you in pictures and words this wide variety of industrial stone files. Write today for "Oilstone File Folder"—*it's free!* Address Dept. MS-6

*Trade Mark

Just a few of the many different shapes of stone files available. Only BEHR-MANNING offers a *complete* line of Natural as well as Manufactured Stones.

BEHR-MANNING • TROY, N.Y.

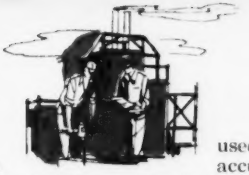
COATED ABRASIVES • SHARPENING STONES
PRESSURE-SENSITIVE TAPES

FOR EXPORT—BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N.Y., U.S.A.

BEHR-MANNING ®
NORTON abrasives

"Sure we use SKIL tools...
we use only dependable equipment"
Says S. J. AUSTIN
Construction Superintendent
Brewster, Florida Plant
AMERICAN CYANAMID
CORPORATION

SKIL tools



—the choice is the same for the men on the job and the men responsible for the job.

Construction superintendent S. J. Austin says: "We've got to have dependable tools to maintain the more than 200 buildings at this plant. That's why we use SKIL Saws, Sanders and Drills. They've got the power to do the work and they require very little maintenance."

Rigger leader A. U. Sineath says: "I've used SKIL Tools for years. They're accurate, powerful and easy to handle."

You can rely on job-proved SKIL Tools. Take SKIL Drills for example—25 models to solve every drilling problem in production, installation, maintenance or repair. Tough enough to get the work done. Light weight and compact enough to do the work faster and easier. Reasonably priced and inexpensive to maintain. Your SKIL Distributor will give you complete information.

A. U. Sineath uses SKIL Drill Model 123 to mount a conveyor belt roller. →

SKIL Drill Model 123

¾ inch drill, heavy duty. Tremendous motor power. Rugged mechanical construction. Capacity in steel: 3/16" to ¾"; capacity in hardwood: 3/16" to 2"; capacity steel reaming: ⅜". No load speed: 375 r.p.m. Slower and faster speeds available. Overall length: 20", weight: 27¼ pounds. See your SKIL Distributor for demonstrations and complete information.

SKIL Products are made only by Skilsaw, Inc.

5033 Elston Avenue, Chicago 30, Ill.

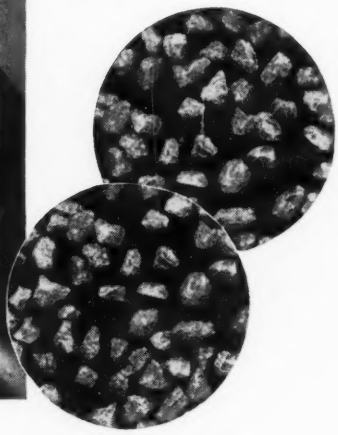
Factory Branches in principal cities

SKIL PORTABLE TOOLS

In Canada: Skiltools, Ltd., 3601 Dundas St. West, Toronto, Ont.

ALUNDUM ABRASIVE LASTS LONGER... POLISHES BETTER...

Because Every Grain Works!



One of the biggest advantages of Norton ALUNDUM Polishing Abrasive is its complete uniformity of grain-size and shape. This means you get no oversize grains to mar the finish — *and no undersize grains to loaf on the job.* That's why, with every grain a working grain, ALUNDUM Abrasive lasts longer and performs better.

In addition, ALUNDUM Abrasive is uniform in chemical composition and crystal structure — extremely hard and tough for fast, clean cut — and has high capillarity that assures firmer adhesion of grain to wheel when glue is used as the adhesive. It is available in sizes and with surface treatments for best results on every polishing job.

Write for Norton Booklet No. 1340, "Setting-Up Polishing Wheels and Belts," containing many helpful polishing tips.

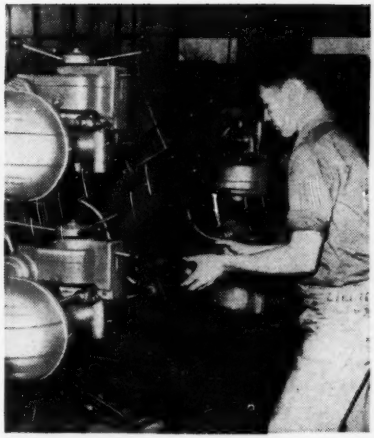
NORTON COMPANY
WORCESTER 6, MASS.
Distributors in All Principal Cities

NORTON
ABRASIVES
Making better products to make other products better

For special drilling machines

WALKER-TURNER DRILL HEADS

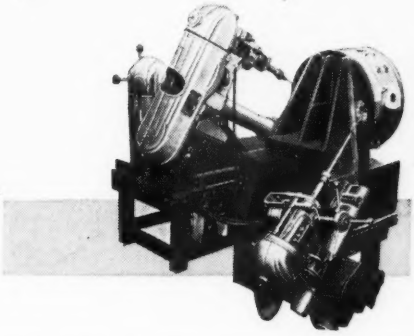
work at all angles, simplify work handling, and cut machining costs



Talk about flexibility! Walker-Turner Drill Heads can be operated in any position, can be attached to other equipment, and are designed to operate continuously at any speed from 400 to 2600 or more r.p.m.

They have a wide range of application. Pictured are just two of the ways Walker-Turner Drill Heads are being used for special set-ups, to simplify work handling and speed production.

If you machine steel, iron, aluminum, copper or brass, plastics or wood, investigate the possibilities of adapting these low-cost, high production tools to your specific needs. Send for catalog.



(Top photo) 8 separate operations are consolidated into one! For this set-up, 4 standard Walker-Turner Power Feed Drill Heads were mounted horizontally to drill both ends of two double-end tube closures simultaneously.

← Typical of the flexibility of Walker-Turner Drill Heads is this special jig application. In designing the cumbersome fixture, provision was made for attaching the drill heads so that work can be handled in a natural position, speeding production.

SOLD ONLY THROUGH AUTHORIZED DEALERS

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS
BELT and DISC SURFACERS • METAL-CUTTING BAND SAWS • METAL-SPINNING LATHES • SPINDLE SHAPERS
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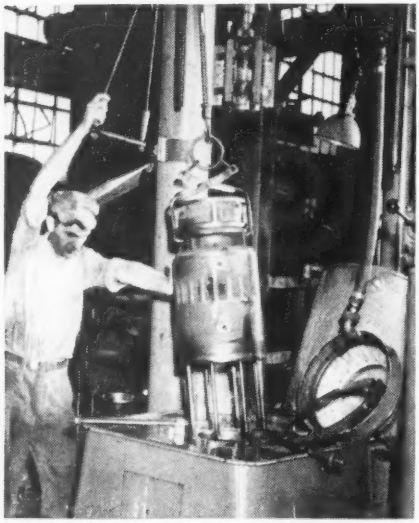
WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

Now! MAKE ONE SOURCE

RESPONSIBLE FOR YOUR HONING RESULTS



FULMER SUPPLIES

HONING MACHINES

Fourteen models cover diameters from 1/4" to 30". Strokes to 84".

HONING TOOLS

Alexander Ball Tools available in sizes to 50".

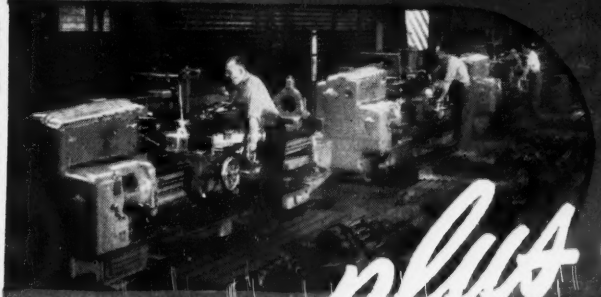
HONING FIXTURES

Why divide responsibility for the performance of your honing operations among several suppliers? Fulmer supplies a *complete honing package* — honing machine, tools and necessary fixtures—giving the user *one* source that *guarantees* best honing results!

Fulmer Honing Machines are engineered to give maximum production with minimum investment. They are known for rapid stock removal and extreme accuracy. Quick change over for various size jobs. The machines are simple to operate—easy to set up—many users have unskilled labor operating them efficiently.

Save on production time, cut costs and improve quality on finishing all classes of cylindrical bores with a *Fulmer Honing Package*—it offers the *greatest value* in the honing field. Write for Bulletin No. 10 and full details.

C. ALLEN FULMER CO. 1233 FIRST NATIONAL BANK BLDG., CINCINNATI 2, OHIO



plus 3 minus 7

A Profitable Investment for *any* plant!

The world-renowned Otis Elevator Company recently installed three "AMERICAN" Duplicator Lathes which replaced seven engine lathes.

Such savings are the rule—not the exception—when "AMERICAN" Duplicators are put on the job.

These machines are performing "miracles" in savings in many of the largest and best known units of the metal working industry. They have introduced a new machining technique that has revolutionized the art of turning metal.

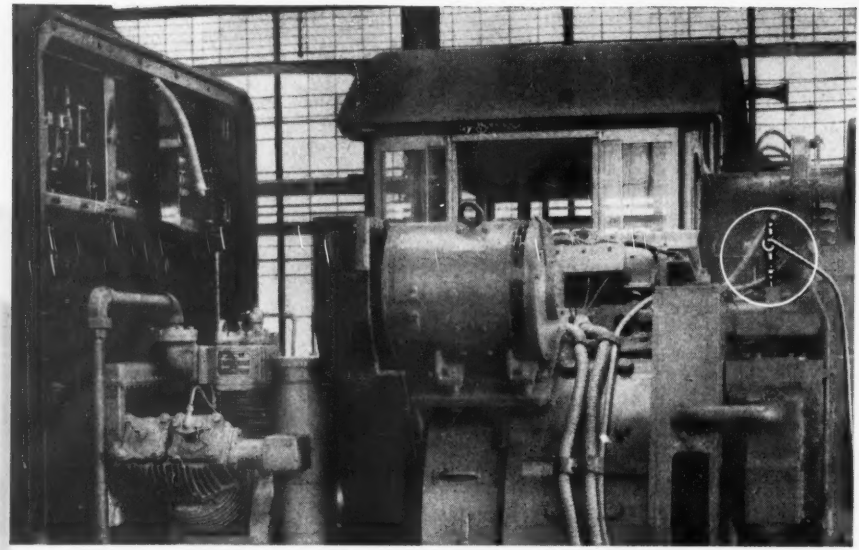
They reproduce work shapes from a template faithfully and accurately. They reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii, and are especially productive on such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

More and more the necessity of reducing manufacturing costs is crystallizing in the minds of management. The attention of directors, top officials and especially production executives is being focused to an increasingly greater degree upon cost-cutting equipment. It is inevitable, therefore, that the "AMERICAN" Hydraulic Duplicating Lathe should command the spotlight. Evidence from a hundred installations proves beyond a shadow of a doubt their leadership as top flight cost reducers.

If it's proof you want just drop us a line—no obligation.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



SILENT! VALVES AT WORK!

Constantly* on Duty to Maintain *Constant* *Pressure on this Diesel engine built by

BALDWIN-LIMA-HAMILTON CORPORATION

(LIMA WORKS) LIMA, OHIO

TRADE MARK FULFLO REG. U. S. PAT. OFF.

OIL-RELIEF BY-PASS VALVES

PRECISION - ENGINEERED . . . WITH FIVE SPRINGS FOR PRESSURE SELECTION.

Chatterless . . . Easily Installed . . . No Further Attention Required.

Pipe Sizes: ¼" to 2" Standard Pipe Thread and Std. 300 Lb. American Flange Valves 1" to 2 ½".

Write on your letterhead for

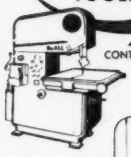
FULFLO MECHANICAL DATA BOOK

THE TRADE MARK FULFLO REG. U. S. PAT. OFF. **Specialties Co., Inc.**

BLANCHESTER, OHIO

DoALL

INDUSTRY'S NEW SET OF TOOLS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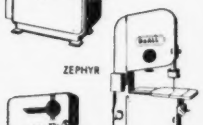
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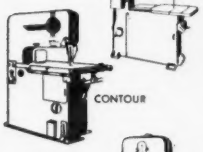
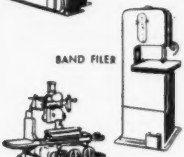
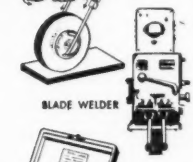

CONTOUR


BAND FILER

TOOLROOM GRINDER

CRUSH GRINDER

"COOL GRINDING" ATTACHMENT


BLADE WELDER

GAGE BLOCKS

GAGE ACCESSORIES

VARIABLE SPEED DRIVES

SAW BANDS

ONLY GAGE BLOCKS CAN CONTROL

THE DIMENSIONAL ACCURACY OF YOUR MEASURING TOOLS

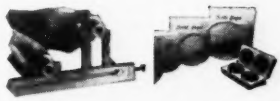
DoALL Offers:

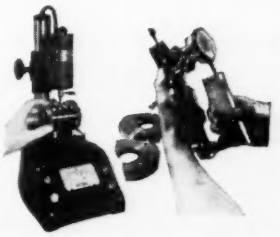
GAGE BLOCKS that are the world's finest in size, flatness, parallelism, finish, stability and hardness. We can prove these factors that give DoALL GAGE BLOCKS longer life accuracy.

INTEGRATED ACCESSORIES FOR GAGE BLOCKS expand the usefulness of your GAGE BLOCKS so that they can be assembled into everyday shop measuring tools having millionth accuracy.

A COMPLETE INSPECTION SERVICE that is prompt and inexpensive for the periodic check of the wear in your GAGE BLOCKS and their growth or shrinkage if they are of a type not fully stabilized.

A DoALL STORE near you has a Gage Specialist at your service. Ask him to prove the superiority of DoALL Gages and write for your free bulletin today.


Gage Block Holders — Optical Flats


Comparators — Dial Indicators

TOOL STEEL — BENCH FILER

The DoALL Company

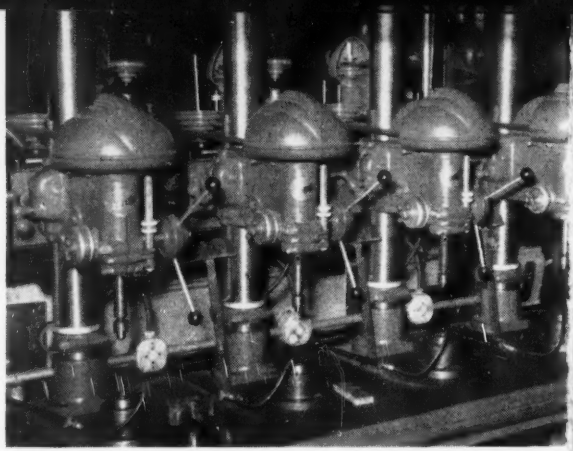
Des Plaines, Ill., U.S.A.

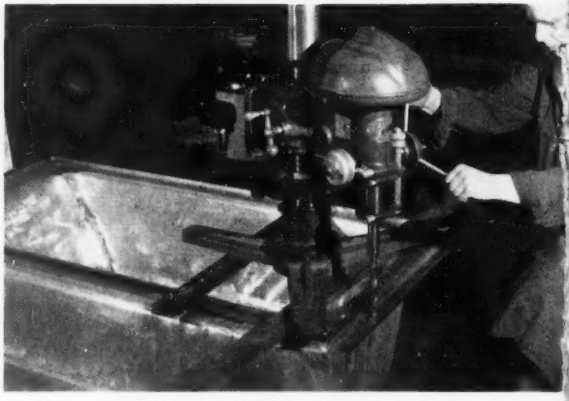
Cable Address: DoALL, Des Plaines

DoALL Stores in Key Cities

Factory Trained Representatives Everywhere

HOW Four Companies Adapted Delta Tools TO CUT COSTS, UP PRODUCTION





1 SIMPLIFIES ACCURATE LOCATION OF WORK PIECES

Bowen Products Corp., Ecorse, Mich. Locating fixtures, properly positioned beneath spindles, were bolted directly to the table of standard 4-spindle Delta 17" drill press. Fixtures are easily removed when job requirements change.

2 EASY DRILLING OF HEAVY CASTINGS

Racine Pattern Works, Racine, Wis. For drilling large awkward castings, the regular base of standard Delta 17" drill press was replaced with 3-leg spider base, so that drill press can be easily slid to proper positions along flange of heavy bathtubs instead of moving work.

3 ROLLS DRILL PRESS INTO POSITION

Cessna Aircraft Co., Wichita, Kans. A roller bridge carries standard Delta drill press along entire length of airplane main spar or backbone, clamped to work table, for accurate positioning.

4 REDUCES FATIGUE, DOUBLES PROTECTION

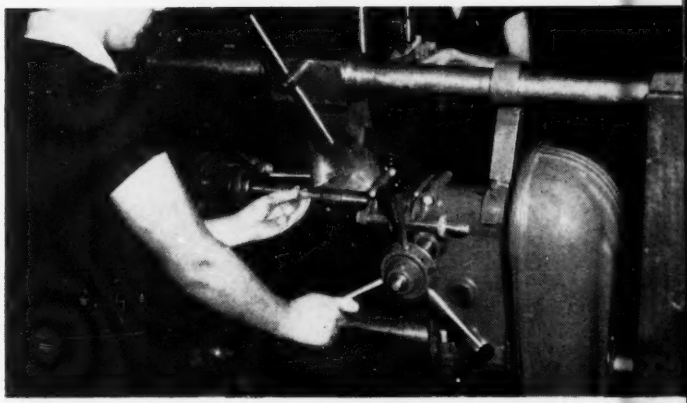
Suprex Gage Co., Ferndale, Mich. For locking a precision gage, Delta 17" drill press heads are mounted sideways, with special fixture. Company uses girls as operators, reports doubled production, reduced fatigue.

1

3

2

4



There's a Delta Power tool for your job....

DELTA WOOD AND METAL WORKING TOOLS—

53 MACHINES — 276 VARIETIES — MORE THAN 1300 ACCESSORIES

For Delta dealers, see your Classified Phone Directory under "Tools"

DELTA MILWAUKEE

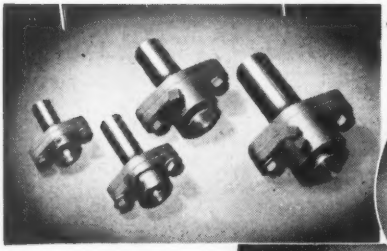
DELTA POWER TOOL DIVISION

Rockwell

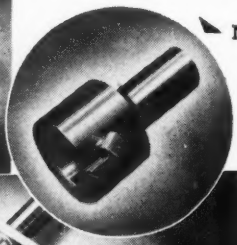
MANUFACTURING COMPANY

603F E. VIENNA AVENUE • MILWAUKEE 1, WISCONSIN

Get *Prompt Delivery* on Screw Machine and Turret Lathe Tools

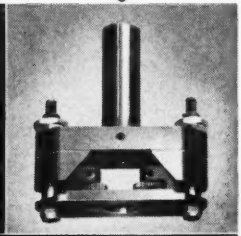


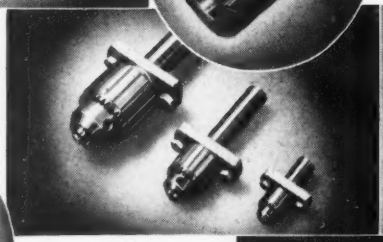
ALL-STEEL PRECISION FLOATING HOLDERS



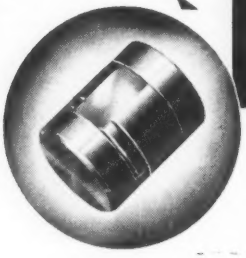
"JAM-PROOF" NON-RELEASING TAP HOLDERS

HIGH-SPEED PRECISION KNURLING TOOLS

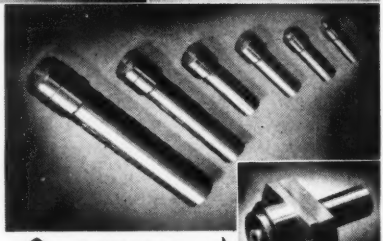




HINGED-SHOE BUSHING BLANKS



CHUCK-TYPE FLOATING HOLDERS



ROTARY STOCK STOPS (Standard & Special)

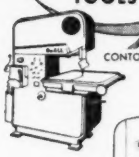
These radically *different* Barnaby tools will give you production performance unequalled by any other products of their type . . . and they can be supplied to you without delivery delay. Let us send you complete literature describing their many exclusive features and listing the ranges of sizes which can be furnished.

A few territories are open for sales representation. Write for full details.

Barnaby MANUFACTURING CO., INC.
70 KNOWLTON ST., BRIDGEPORT 8, CONN.

DoALL

INDUSTRY'S NEW SET OF TOOLS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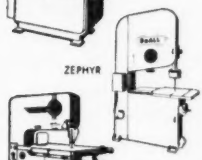
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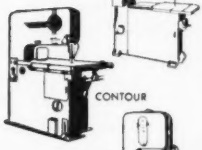
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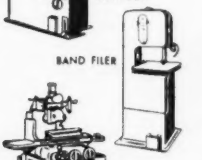
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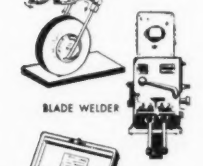
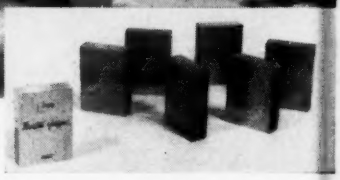

BLADE WELDER

GAGE BLOCKS

GAGE ACCESSORIES

VARIABLE SPEED DRIVES

SAW BANDS



IMPOSSIBLE?

It's EASY with a DoALL SURFACE GRINDER!

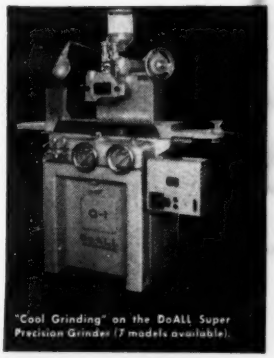
Problem: Grind a chuck-load of gage block blanks, flat and parallel to .0001" leaving .0001" for lapping. Surface finish must be .000007" RMS or better.

Solution: Use any DoALL Precision Surface Grinder, with "Cool Grinding."

Precision Grinding is one of the first steps in the production of DoALL Gage Blocks. DoALL Grinders have inherent rigidity, plus a fine spindle and smooth operation that make it possible to finish grind with cuts as deep as .025".

DoALL "Cool Grinding" adds to wheel life and prevents burning of the work.

Let us show you, through actual demonstration, how DoALL Surface Grinders can save you time and money. Write for complete information today.


"Cool Grinding" on the DoALL Super Precision Grinder (7 models available).

TOOL STEEL

BENCH FILER

The DoALL Company

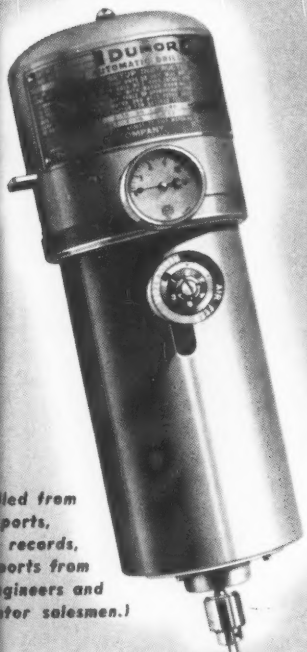
Des Plaines, Ill., U.S.A.

Cable Address: DoALL, Des Plaines

DoALL Stores in Key Cities

Factory Trained Representatives Everywhere

A Report to Small Drill Users



(Compiled from user reports, service records, and reports from field engineers and distributor salesmen.)

an analysis of shop performance by the first 750 Dumore Automatic Drill Heads

What is this tool?

The Dumore Automatic Drill Head is a compact, motor-driven head with self-contained air compressor for advancing drill. Sensitive and automatic control of speed and feed gives increased production and less drill breakage. Head can be operated manually, or automatically, with any number controlled from one master switch. Drill capacity is No. 80 to 3/32" in steel and No. 80 to 1/8" in zinc, aluminum, brass, etc., and No. 80 to 5/32" in plastics and wood.

Who bought the first 750?

Drill Heads were purchased by both small and large shops in almost every industrial classification. Determining factor apparently was whether or not production quantities of small holes were involved.

How did production stack up against advertised claims?

The majority of users reported increases greatly in advance of company claims for the tool. In every case, where the heads were applied correctly within rated capacities, production was definitely increased. We have reports from users listing savings of $10,000 a year from around $400 investment in two Drill Heads; cost reductions of 97%; etc. Unquestionably, in many cases, the user's skill in designing jigs and fixtures to utilize the Drill Head's tremendous output potential was a determining factor in obtaining an above average percentage of production increase.

How much was saved on drills?

Savings of 14 to 20 small drills per shift were quite common. Figuring an average cost of 30¢, drill savings alone often paid for the drill heads in a matter of months, to say nothing of even larger savings from reduction of scrap loss and downtime. Although users were conscious of these economies, it was generally agreed that the spectacular production increases obtained were still more important.

What "bugs" turned up?

For a new tool, mechanical problems have been remarkably low. There have been no mechanical "bugs," and only a few headaches have resulted from the abuse of these precision tools by the operator. These include:

1. *Operation of the tool beyond Dumore rated capacity, which is always bad practice.*
2. *Clamping the housing too tightly in the set-up, which destroys close operating tolerances and causes friction and heating.*
3. *Use of an unrecommended oil, which gummed precision parts and, in some cases, froze heads.*

In every case, correction of the bad operating or maintenance practice resulted in satisfactory production from the tool.

Repeat business — the acid test?

Repeat business has been heavy! Where hole volume justified multiple heads, purchase pattern shows initial purchase of one head for trial, followed by quantity re-order and repeats as head proved out. For instance, one eastern firm now operates 40 Dumore Drill Heads and plans to order 40 more.

How much does a Dumore Automatic Drill Head cost?

Less than $200. A complete line of accessories, including bench stand, repeat-cycle timer, and remote control switches are available.

What is the delivery situation?

Good. 3 to 5 weeks at time of writing. We're stepping up output to meet current heavy defense demands and still hold to the present delivery schedule.

If you're doing production drilling with No. 80 to ⅛" drills, you should investigate this revolutionary production tool. It's easy to figure the savings the Dumore Automatic Drill Head can make for you, in your own plant . . . on your own jobs. Write today for complete information, including job data reports, that will help you reduce your drilling costs.

THE DUMORE COMPANY

DEPT. F-33 RACINE, WISCONSIN

Export Address: **13 East 40th Street, New York 16, N.Y., U. S. A.**

DDH-8

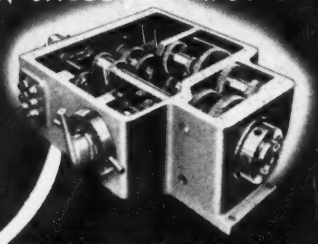
BUILDERS OF MACHINE TOOLS AND MOTORS

NOT JUST ANOTHER LATHE

but a Sidney Lathe!

Check these features...

Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock. Drive shaft deflection is thus eliminated.



All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.

Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

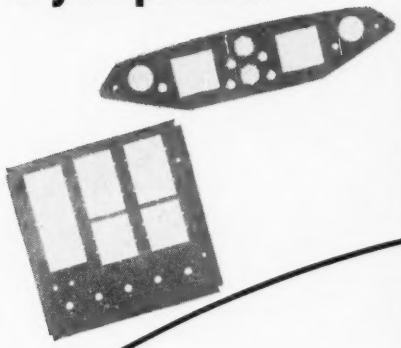
Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.

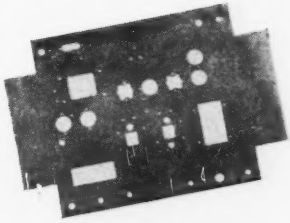
Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

Builders of Precision Machinery Since 1904

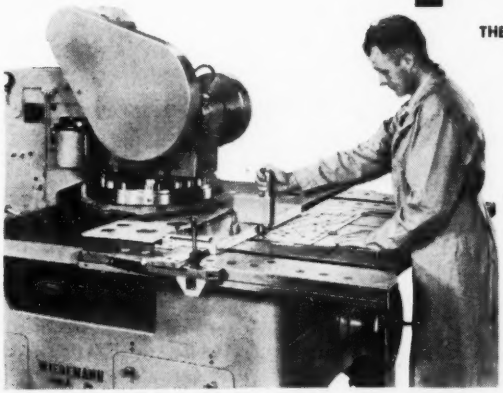
if you produce...





SEE WIEDEMANN

Bulletin 241 describes the most efficient method of producing chassis and similar work in short runs and semi-production runs. Repeat runs of 5 to 1,500 pieces and single runs of 50 to 5,000 pieces are economically produced on the Wiedemann RA-41P. Write today for bulletin 241.



THE WIEDEMANN METHOD permits you to: (1) Keep up with engineering changes without materially affecting production schedule; (2) Keep tool inventory low; (3) Produce quantities in accordance with sales requirements; (4) Produce accurate work with inexpensive tools.

"THE WIEDEMANN METHOD" through the elimination of expensive punch and die set-up and work location methods, provides an efficient means of piercing single pieces, and semi-production runs, regardless of repeat frequency.

Machines available for piercing sheet and plate up to ½" thick, up to 120" wide x 200" long.

Wiedemann
TURRET PUNCH PRESSES

WIEDEMANN MACHINE COMPANY
4219 Wissahickon Ave., Phila. 32, Pa.

Arrows point to NOPAK Model "D" Air Cylinder which locates workpiece for clamping. NOPAK 4-Way Valve is shown in circle.

NOPAK 4-WAY VALVE Controls

Model "D" Cylinder and Air Chuck on Sundstrand Lathe

NOPAK ¼" 4-Way Hand Valve controls both air chuck and NOPAK Model "D" Air Cylinder.

In this lathe application, a ½" NOPAK 4-Way Valve performs two vital functions. (1) It controls the NOPAK Model "D" Cylinder which locates the workpiece before clamping, and (2) it operates the air chuck. When the valve is open, the chuck is unclamped and the "locater" is down; when the valve is closed, the chuck is clamped and the "locater" is up.

This application of a NOPAK Valve and Cylinder is typical of many in the machine-tool field. It may suggest how you can use NOPAK products to improve the performance of machines or equipment which you use in your plant, or build for others.

GALLAND-HENNING MFG. CO.
2758 S. 31st Street, Milwaukee 46, Wis.

Write for Bulletin SW-1 or refer to Sweet's File for Product Designers.

Representatives in Principal Cities

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A 5938-½I

CALL DoALL
for immediate delivery!
PRECISION GROUND
OIL HARDENING FLAT STOCK

Use it for Making:

GAGES

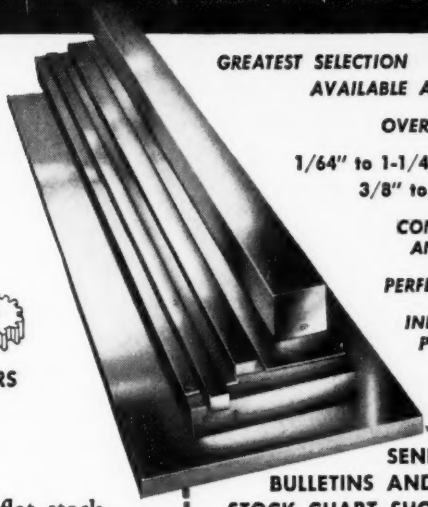
PUNCHES AND DIES

CAMS

SPECIAL PARTS

GEARS

Jigs, Templates, Tools
and many other parts



GREATEST SELECTION AVAILABLE ANYWHERE!

OVER 200 SIZES

1/64" to 1-1/4" Thickness
3/8" to 14" Width

CONTROLLED ANALYSIS

PERFECT FINISH

INDIVIDUALLY PACKAGED

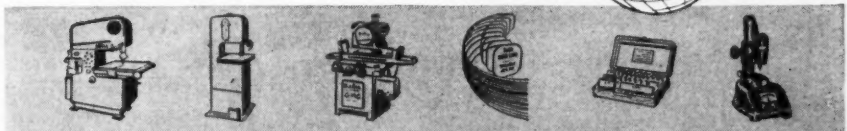
DoALL precision ground flat stock eliminates costly machining of stock to size, assures you accuracy, fine finish and no shrinkage. Select the sizes you need and you are ready for layout work. *Call DoALL* today.

THE DoALL COMPANY
254 N. Laurel Ave.
DES PLAINES, ILL.

SEND FOR BULLETINS AND FLAT STOCK CHART SHOWING SIZES AND PRICES.

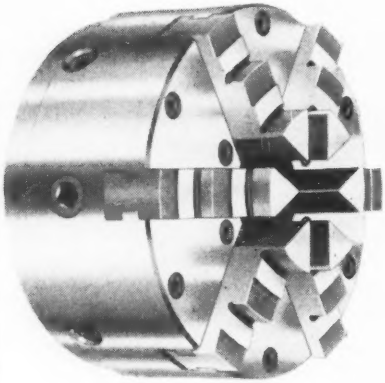
27 SALES-SERVICE STORES

DoALL



CONTOUR SAWING MACHINES • SURFACE GRINDERS • GAGES • CUTTING TOOLS & INDUSTRIAL SUPPLIES

Buck AJUST-TRU **CHUCKS**



6 Jaw Chuck Handles Work of 93 Collets!

Scroll chuck speed— with .0005 precision

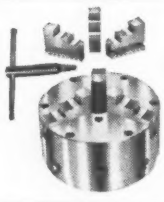
HOW IT WORKS

One pinion (shown in center of chuck body) moves jaws in or out to grip work like any scroll chuck. 4 opposed screws work on the chuck adapter to bring work to dead center. Once set dead true, you can machine hundreds of duplicate parts without changing adjustment. Inexperienced men have centered work within .0005 in 3 minutes!

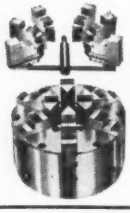
It's unbelievable—but TRUE. *This one 6" chuck will do the work of 93 collets!* Spindle capacity is from 1/8" to 1 1/2" by *.001*. Step collet capacity from 1/8" to 5" by *.001*. In addition, you get the firm grip of 6 jaws, minimum overhang, *and .0005 precision with scroll chuck rechucking speed*. All this at ordinary scroll chuck cost!

It ends most needs for stub arbors and mandrels. It can be used on dividing heads, grinders, screw machines, lathes. Few, if any, developments of recent years have done so much to save machinists time. Send for literature—see for yourself.

BUCK TOOL COMPANY
614 Schippers Lane **Kalamazoo, Mich.**



3 STEP-JAW CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty



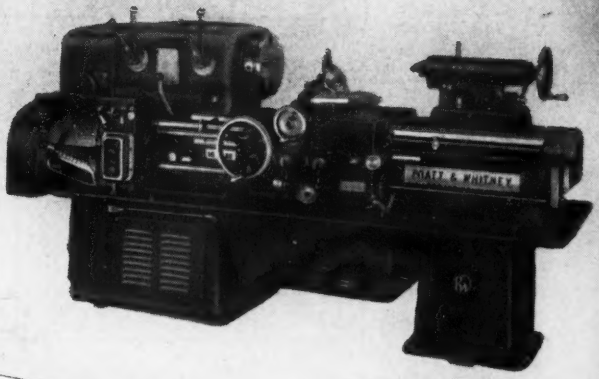
6 STEP-JAW COLLET CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty

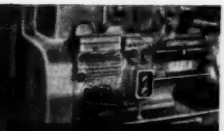
6 JAW PRODUCTION COLLET CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty

Model "C"

PRECISION LATHES

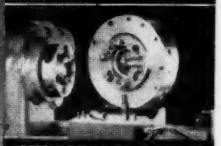
12 INCH 14 INCH 16 INCH





QUICK CHANGE GEAR BOX
Smooth shift to any thread or feed indicated on direct reading plate.

SUPER-PRECISION SPINDLE
Two preloaded precision bearings at front end. Anti-friction type needle bearing at rear.



CAM-LOCK SPINDLE NOSE
A P&W development now standard on most quality lathes. Provides greater rigidity for chuck or face plate. Cannot "freeze" on.

REMOVABLE APRON FRONT
No need to remove apron assembly or disturb precision lead screw when making adjustments.

WAYS FLAME HARDENED
Permanently stable and accurate. Finish-grinding on special machines assures perfect bearing and smoothness.

THE STANDARD BY WHICH ALL FINE LATHES ARE JUDGED

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

"THERE'S NO BETTER-PAYING INVESTMENT THAN THE RIGHT TOOLS FOR THE JOB."

Hole Location Practices

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 730 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

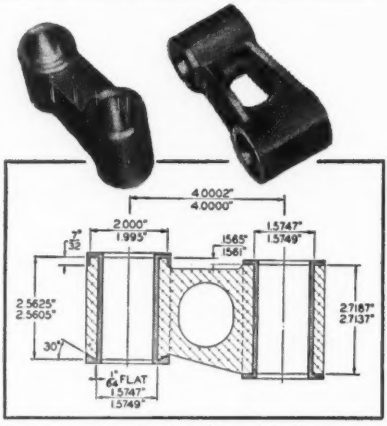
JIG BORING CUTS

Production Time 90%

It took 3½ hours to machine each of these aluminum-alloy supporting arms, used on our Moore Panto-Crush Wheel Dresser, on a boring mill. Now—on our No. 2 Jig Borer—it takes only 22 minutes per piece for lots of 100—a time saving of 90%. Hole diameters and between-centers dimensions are held to 0.0002" to insure extreme accuracy between pivot points in the wheel dresser and allow the installation of precision bearings in the holes. Read the job details at the right.

Moore Jig Borers are being used more and more on short-run production of precision work—boring, drilling, reaming and inspecting precisely located and machined holes in production parts, as well as in dies, jigs and other tools.

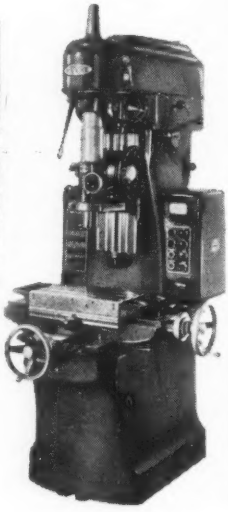
Write today for our new 24-page catalog, containing other examples of time- and cost-cutting Jig Borer operations.



Two holes, three flat and one beveled face and shoulder on one boss (the areas crosshatched in drawing) are all machined on the Jig Borer—in only 22 minutes.

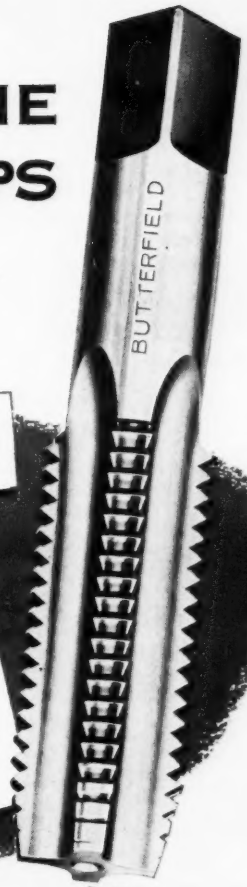
Oper. No.	Operation Name	R.P.M.	Feed	Min.	Sec.
1	Load and mill ribs — Single Point fly cutter	1000	H	1	00
2	Set Up and rough bore — two holes	2000	.0015	2	10
3	Rough face two top surfaces Single Point fly cutter — Remove part to cool —	1000	H	1	35
4	Load and second rough bore two holes	2000	.003	1	50
5	Finish bore two holes	2000	.0015	2	40
6	Check two holes for size			1	00
7	Rough and finish 30° bevel	800	H	3	00
8	Rough and finish one bottom face	800	H	1	00
9	Finish face two top surfaces Out-feed chuck	800	.0025	4	35
10	Rough and finish 2" diameter shoulder	400	H	3	00
	TOTAL TIME			**21**	**50**

Checking hole size—held to 0.0002". Simple holding fixture provides both boring and milling positions.



No. 2 Moore Jig Borer Table Working Surface of 10" x 19"; Accurate lead screws; infinitely variable spindle speeds, 30 to 2100 R.P.M.; 3 power feed ratios.

TIPS ON THE TOPS IN TAPS

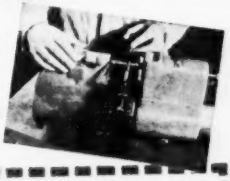


1 They're the complete line, for every tapping application, in every material

2 They're made in high speed or carbon steel, for best results on every job

3 100% inspected...each tap individually inspected

4 They're Butterfield, of course!



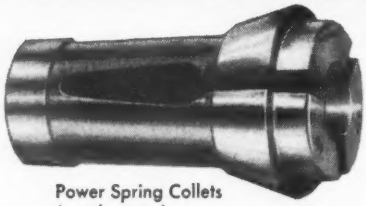
Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps
Pipe Taps • Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps
Nut Taps • Serial Taps • Tapper Taps
Mud or Washout Taps

See Your Nearby Butterfield Distributor For Prompt Deliveries and Service

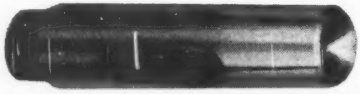
Union Twist Drill Company
BUTTERFIELD DIVISION
Derby Line, Vermont
In Canada: Rock Island, Quebec

BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES

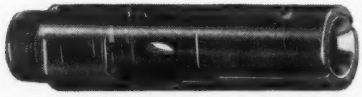


Power Spring Collets
(regular type)

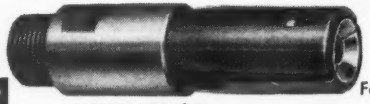
Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads



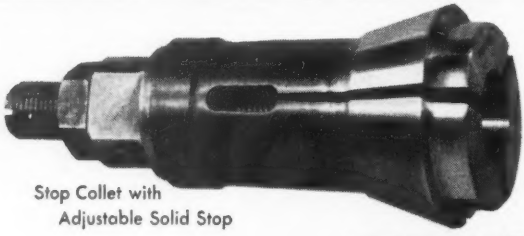
Master Feed Fingers
with Adjustable Tension

HARDINGE
ELMIRA, N.Y.

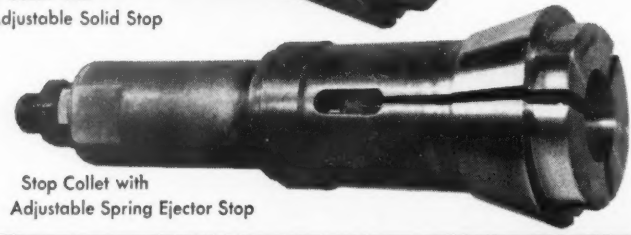
PRECISION PRODUCTS
for BROWN & SHARPE machines

For maximum production efficiency, specify Hardinge precision products for your Brown & Sharpe Automatics and Wire Feed Screw Machines. Reduce tooling costs and step up production with these and other Hardinge precision products engineered, customer-shop tested, and approved for Brown & Sharpe machines. Write for Catalog 36 — contains complete descriptions, specifications, and ordering information.

Deliveries from stock



Stop Collet with
Adjustable Solid Stop



Stop Collet with
Adjustable Spring Ejector Stop

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

● A very accurate 6" x 18" Hand Feed Surface Grinder especially adaptable for Tool Room Work and work on small, fussy pieces.

a time tested line of machine tools

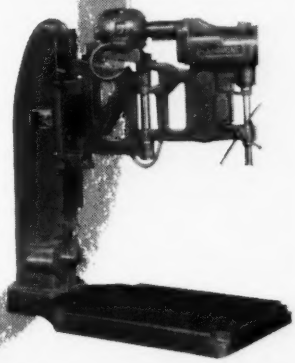
ENGINEERED FOR PRODUCTION

The choice of fine machine tools is an investment for future profits when products have to be made with increased accuracy and efficiency.

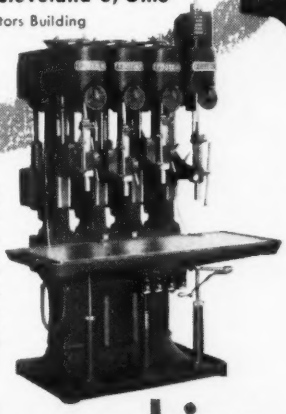
These machines are built with the usual Footburt workmanship and sturdiness that will keep them accurate over a long period.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

Detroit Office: General Motors Building



● A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.



● Built in 1, 2, 3, 4 and 6 spindle models, also as a tool room drilling machine, these sensitive drilling machines are accurate for the most exacting work and have the usual Footburt sturdiness of construction to make them suitable for continuous production line work. The above 4 spindle machine has tapping attachment and power feed attachment.

FOOTBURT machine tools

a time tested line of machine tools

Backstand Method Saves Time!

Toledo Steel Tube Co. saves 2 hours per operator per day in finishing department

The Toledo Steel Tube Co. uses the backstand belt method to remove burrs and grip marks from the tubing. This company points out the following advantages of the backstand belt method over the set-up wheel method:

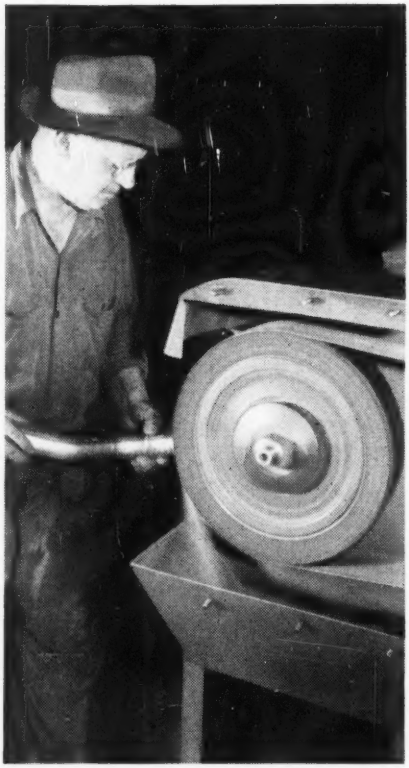
1. Time is not lost in making set-up wheels. Formerly the operators were given 2 hours a day for making their set-up wheels.

2. One backstand belt will outlast 4 to 5 set-up wheels for this application.

3. Belts maintain a flat surface for the grinding and polishing operation, whereas set-up wheels became rounded and needed dressing from time to time.

4. The uniform grit on the belts gives a much better finish on the tubes than did the rolled-on grit of the set-up wheels.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces, the backstand belt method can help you. Write today for our free booklet.



Mail this coupon today!

Please send me the booklet "Facts About Backstand Belt Grinding and Polishing."

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Title .....

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Address .....

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We recommend buying through your industrial distributor

ARMOUR

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SHEETS • ROLLS • BELTS • DISCS

Armour and Company
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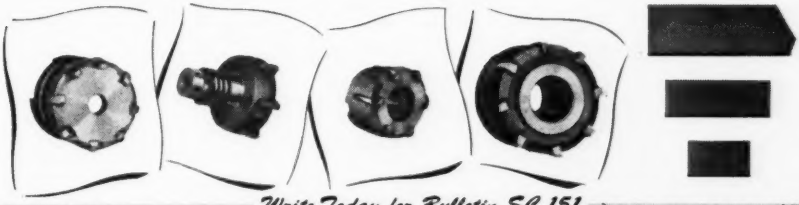
FOR TAKING FULL ADVANTAGE OF SOLID CARBIDE FOR THE FIRST time!

"RIDGIDCUT" FACE MILLS with WESSONMETAL SOLID CARBIDE BLADES

Taking full advantage of solid carbide for the first time—Wesson now offers a completely new line of Wessonmetal Solid Carbide Blades designed to be held mechanically (without brazing) in almost every type of cutting tool. Wesson's rigid, replaceable solid carbide blades combine efficiency and economy exceeding any development during the past 20 years.



Write Today for Bulletin SC 151

WESSON COMPANY *Affiliated with* WESSON METAL CORPORATION

1220 Woodward Heights Blvd., Ferndale (Detroit 20), Mich.

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

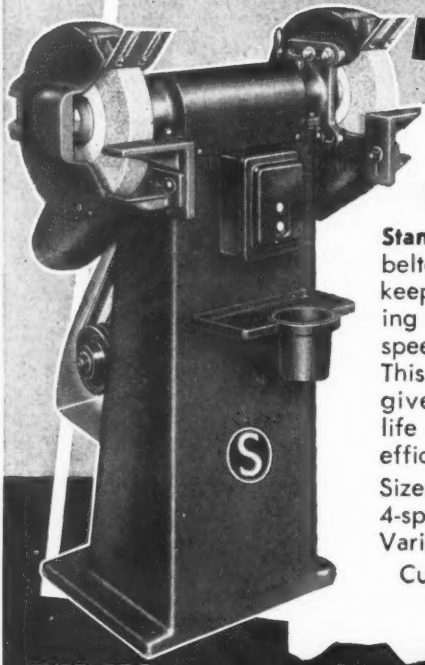
TRIPLE savings

IN YOUR GRINDING ROOM

1 LOWER WHEEL COSTS

2 SAVES TIME

3 INCREASED PRODUCTION



ON GRINDERS
FROM 1 TO 100 H.P.

HERE'S HOW!

Standard's BDG self-contained belted motor driven grinders keep your grinding wheels turning at the correct peripheral speeds down to wheel flanges! This new engineering feature gives you maximum wheel life and far greater grinding efficiency.

Sizes: 10" 3-speed 1 H.P. to 30" 4-speed 60 H.P. Also Infinitely Variable Speed.

Cut your grinding costs today.

Write for Catalog 44.

TYPE BDG

THE STANDARD ELECTRICAL TOOL CO.

Visit our Booth 103, Triple Industrial Convention, San Francisco, June 11, 12, 13. We would like to discuss the type BDGwith you!

2487 RIVER ROAD **CINCINNATI 4, OHIO**

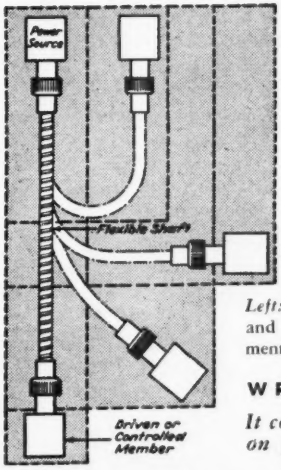
CUT DESIGN and PRODUCTION TIME!

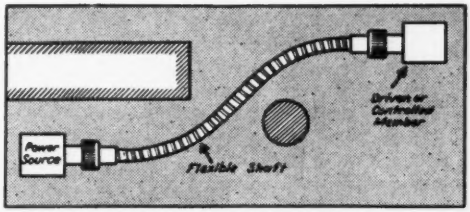
...with S.S.WHITE Flexible Shafts

S.S.White power drive and remote control flexible shafts do away with time-consuming layout problems — figuring of gear ratios and the placement of units. Their one-piece construction gives extreme flexibility of design.

When it comes to production, S.S. White flexible shafts are easy to install, even for inexperienced personnel. No alignment is needed, just a simple coupling at each end and the shaft is in operation.

You'll save time and costs by thinking in terms of S.S. White flexible shafts on *any* drive or control problem.





Above: A single, easily applied flexible shaft transmits power or control between any two points regardless of their relative location or intervening obstacles.

Left: A flexible shaft simplifies problems of space and gives wide latitude in determining equipment dimensions.

WRITE FOR BULLETIN 5008

It contains the latest information and data on flexible shafts and their application.

THE S.S.White INDUSTRIAL DIVISION
DENTAL MFG. CO.

Dept. 5, 10 East 40th St.
NEW YORK 16, N. Y.

It's easy to
RADIALLY RELIEVE
your cutting tools
Inter-changeable cams and index plates for 1 to 14 flutes.
Inter-changeable collets up to 1.125" D.
Preloaded ball bearing spindle.
Easy-to-read settings. Easy to set up.
Base swivels for angular grinding.
Mounts on most grinder tables.

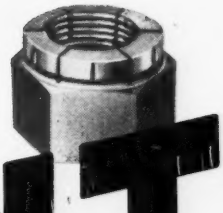
D•S is at work in grinding rooms across the country producing better cutting, longer lived taps, counterbores, step drills, center drills, etc. Available in hand operated and motor driven models. Have you investigated it? Write today for catalog.

D•S GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
621 E. Fourth St., Royal Oak, Mich.

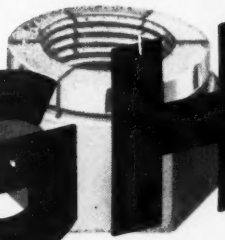
D•S RADIAL RELIEF GRINDER

FLEXLOC®

SELF-LOCKING NUTS

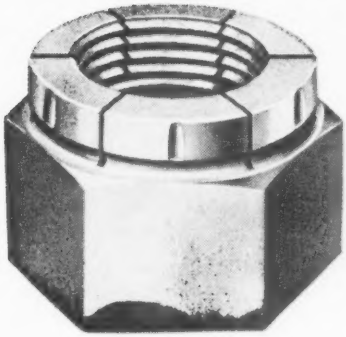


STAY TIGHT AFTER



171,360,000

VIBRATIONS AT 4,000 CYCLES PER MINUTE



Plain nuts with lock washers loosened after only ONE HOUR of 4000-cycle-per-minute operation on the vibrator of a concrete block machine at the plant of the Bethayres Concrete Block Co., Bethayres, Pa.

When FLEXLOC Self-Locking Nuts were installed, they were *still tight* when the machine was torn down for rebuilding after 6 weeks operation—at 4000 C.P.M., 17 hours a day, 7 days a week!

So if you have an application where plain nuts might or actually do loosen and back off, try **FLEXLOC, the one-piece, all-metal STOP- and LOCK-NUT "that won't work loose."**

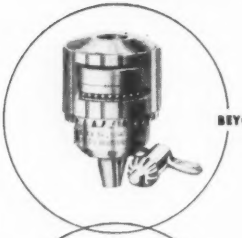
Send for Bulletin 619-A today.

SPS **STANDARD PRESSED STEEL CO.**

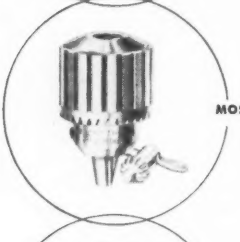
JENKINTOWN 22, PENNSYLVANIA

FOREMOST IN CHUCKS...

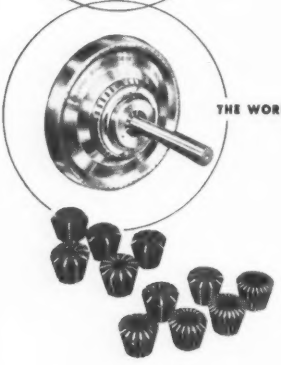
Unmatched For Accuracy And Gripping Power, Jacobs Chucks Are Vital Links Between Power Tools And The Finished Job



BEYOND ALL COMPARISON. Say "Jacobs Ball Bearing Super Chuck" and you've mentioned the last word in drill chucks. No other chuck ever made compares with this blue-chip wonder — in which Jacobs' famous ball bearing construction, tough alloy steels and precision workmanship combine for the tightest practical grip and great accuracy. That's why the Jacobs Ball Bearing Super Chuck is tops throughout the world for heavy-duty drilling.



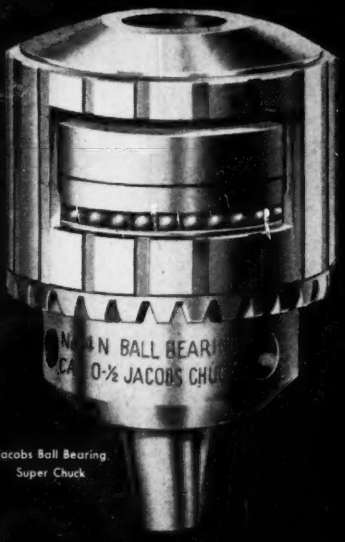
MOST WIDELY USED DRILL CHUCK IN THE WORLD. Made of the same rugged materials and to the same close tolerances as the Jacobs Ball Bearing Super Chuck, the Jacobs Plain Bearing Chuck is particularly designed for portable tools and light and medium duty drill presses and lathes. Because of its matchless gripping power and accuracy it has been incorporated as standard equipment by the overwhelming majority of portable tool users both here and abroad.



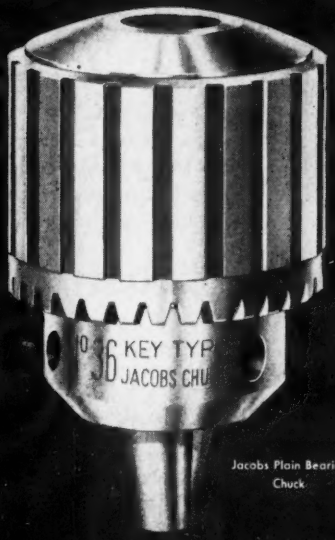
THE WORLD'S OUTSTANDING LATHE COLLET CHUCK. Introduced less than two years ago, the Jacobs Spindle Nose Lathe Chuck has already gained sensational acceptance. Users who want the very best in machine tool performance are insisting on this chuck — thanks to its many improved features, including advantages never before obtainable in collet equipment. For example, there's the amazing capacity range of its collets, each of which closes through a full $\frac{1}{8}$" range without the slightest loss of accuracy or gripping power. And only eleven Jacobs Rubber-Flex Collets are required to chuck bars of any diameter between $\frac{1}{16}$" and $1\frac{3}{8}$" — assuring exceptional savings over the cost of conventional chuck-and-collet equipment.

THE JACOBS MANUFACTURING COMPANY
35 Jacobs Road, West Hartford 10, Connecticut

FIRMEST IN GRIP

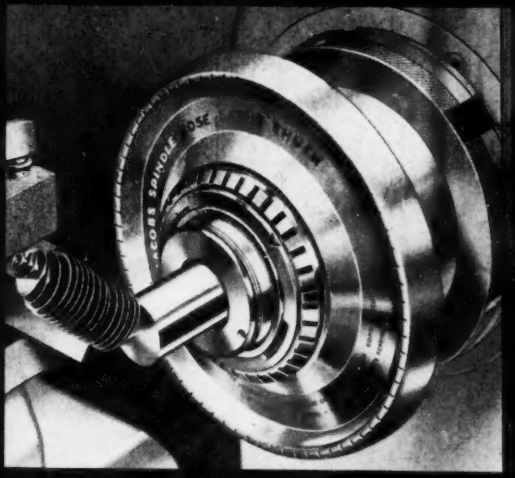


Jacobs Ball Bearing
Super Chuck



Jacobs Plain Bearing
Chuck

Jacobs Spindle Nose Lathe Collet Chuck



IF IT'S A

JACOBS

IT HOLDS!

CUT COSTS BY CUTTING *faster*

With a STONE Swing-Cut M14

A Low-Cost Metal Cut-Off Machine That Performs Production Cutting Of Ferrous and Non-Ferrous Solids Up to 1½"—Pipe and Structurals Up to 2½" At the Rate of—

4 SECONDS PER SQUARE INCH

And May Be Used For Miscellaneous Cutting of 2" Solids (15 seconds).

Swing-Cut M14 Speeds Up Cutting Operations—Prevents Bottlenecks

- cuts faster, cleaner with positive drive
- swivels up to 45° in either direction
- 32" x 34" bench model — app. weight 300 lbs.
- designed for flexibility — easy, safe operation

CUTTING DATA

Material	Size	Time per Cut
COLD ROLLED STEEL — Bar Stock	1" x 1½"	6 sec.
HIGH SPEED STEEL — Bar Stock	1" x 1"	4 sec.
PIPE — Heavy Steel	2⅛" O.D.—¼" Wall	10 sec.
TUBING — Stainless Steel	1¼" O.D.—⅛" Wall	2 sec.
STRUCTURAL — Angle Iron	2" x 2" x ¼"	5 sec.
ALUMINUM — Bar Stock	1" x 1½"	3 sec.
BRASS — Pipe	1½" O.D.	3 sec.
COPPER — Bar Stock	1" x 1¼"	5 sec.

Swing-Cut M14 asks little — gives a lot! Available at a lower price than any other machine of its capacity, this rugged little brute requires only 9 square feet of bench space to perform fast, clean, low-cost abrasive cutting. Engineered with positive drive without the use of belts (an exclusive Stone feature), the Swing-Cut M14 full 3½ h.p. geared-in-head motor delivers maximum constant power — increasing cutting speed, affording greatest efficiency and insuring longer wheel life.

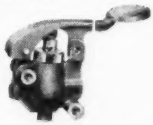
Write for Further Information

STONE MACHINERY CO., INC.

302 Fayette St. Manlius, N. Y.

Schrader Valves—Practical answers to air control problems

To meet the vast and increasing variety of applications for air cylinders and other air line accessories, Schrader supplies a comprehensive range of equally useful control and operating valves for operation by hand, foot or cam. Shown below are just a few from Schrader's more than a hundred models.

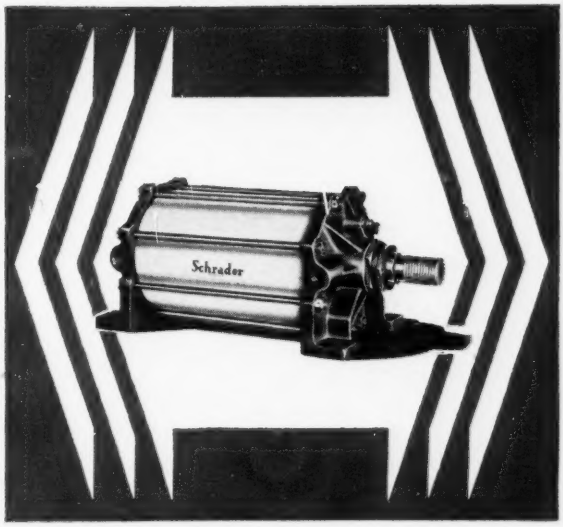


Hand Lever—This is one of the many Schrader hand-operated valves. Brass body with stainless steel parts. Can be mounted rigidly at any angle. Specially constructed lever makes operation easy and safe.

Valves with roller lever—These valves are designed for any cam actuation. The free turning roller riding on a cam provides long life by reducing friction.

Pilot valves—Both two and three way, with or without timer. Normally open or normally closed. Provides instant power at remote points.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings



Four ways that air cylinders can increase production in your plant

You can make hard work easy, eliminate manual effort and speed up production by the application of air power . . . often the best, usually the economical way to apply force where you need it. For example:

- *To provide a powerful push*
- *Where clamping is necessary*
- *For lifting operations*
- *To power a reciprocating motion*

Schrader Air Cylinders are increasing production through safer, faster and less fatiguing operations, in thousands of applications in plants throughout the country.

Undoubtedly there are many places in your own plant where Schrader Air Cylinders will be just the thing. Ask us to help you determine what will best fit your needs. Send us a letter outlining your particular installation requirement, your idea, or fill out the coupon below.

Schrader PRODUCTS CONTROL THE AIR

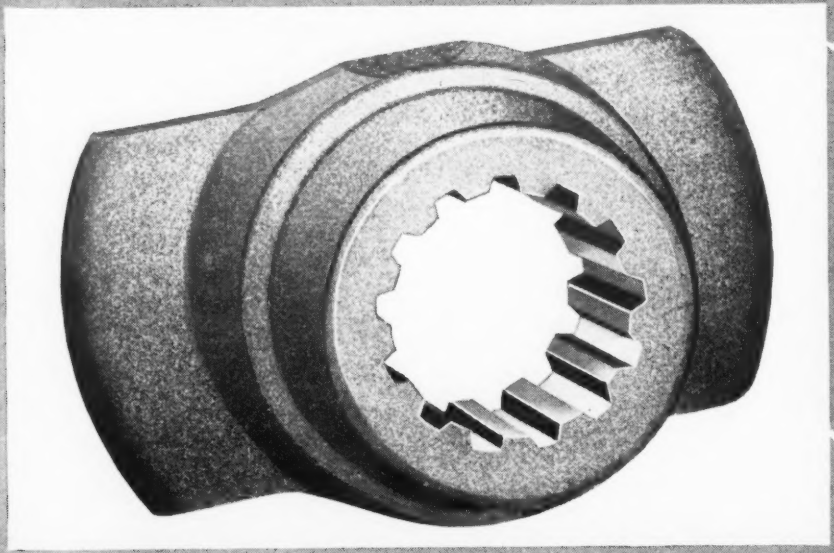
Mail This Coupon Today

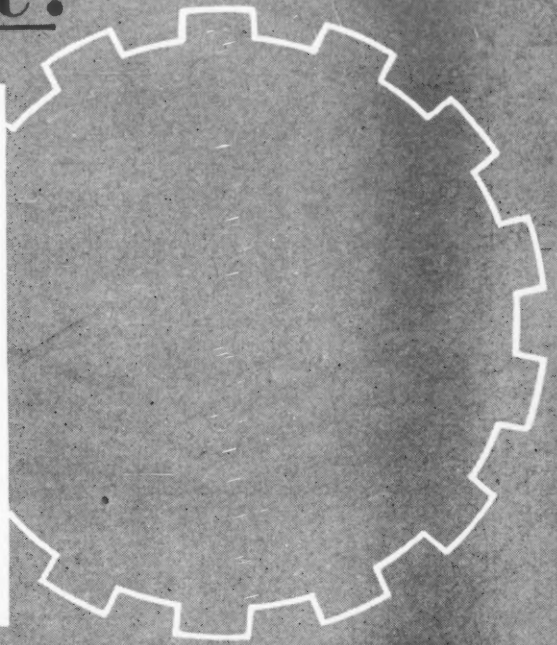
A. Schrader's Son
Division of Scovill Manufacturing Co., Inc.
461 Vanderbilt Avenue, Brooklyn, N. Y., Dept. G-3

Please send me further information on the Schrader ClampAir and valves.

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Lower Cost-per-piece:





BROACH REDESIGN ***cuts tool costs—boosts life***

SAVES 450^{00} **MONTHLY**

Redesign of the tools for this spline broaching operation resulted in a 24% reduction in original tool cost, 22% increase in the number of sharpenings per tool as well as a 14% increase in the parts produced per sharpening. The result in terms of cost-per-piece was a net saving of $450.00 per month.

Slight savings in production and sharpening time were effected due to the fact that this redesigned tool was shorter than the original. However, in many cases lowest cost per piece can be achieved only through redesign which increases tool length . . . a decision which is best made for each application by qualified broach specialists.

This spline operation is but one typical example of how Detroit Broach specialization in broaches and broaching tools pays off. Such specialization provides a back-log of experience which is unparalleled as the basis for sound recommendations. Whether you are considering conversion to broaching or more for your money on present broaching operations, don't fail to consult Detroit Broach. We will be very happy to supply actual cost and production data.

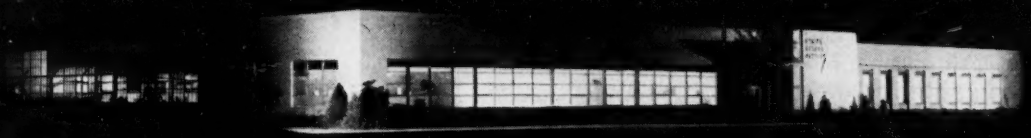
DETROIT BROACH CAN CUT YOUR COST-PER-PIECE

by

1 Developing broaching set-ups to replace other, more costly machining methods.

2 Redesign present broaches and broaching set-ups to make them more efficient.

WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY



DETROIT BROACH COMPANY

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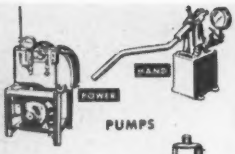
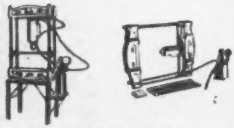
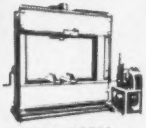


PUMPS

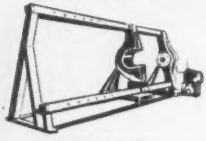
CYLINDERS



UNIVERSAL PRESS



SHOP PRESS



FORCING PRESS

TRACK PRESS

PINION PULLER

JACKING UNIT

Above is a standard Rodgers 60 ton Shop Press with a Rodgers Power Pump. Other models have capacities of 80, 100, 150, 200, 300 and 400 tons.

HERE'S Rodgers Hydraulic POWER ...to do 101 jobs faster, better, easier

You'll find a Rodgers Shop Press is the finest all-around time-and-labor-saving equipment you can have in your plant . . . for a multitude of pressing, forming, bending, straightening jobs . . . for die tryout . . . and even short production runs.

Their many exclusive features make Rodgers Shop Presses unusually versatile in performance . . . and there are several standard models and capacities to suit most every shop or plant requirement.

Other Rodgers Hydraulic Equipment is available too, for *your* special jobs.

SEND FOR CATALOGS

Complete details of Rodgers Equipment are covered in available catalogs. Write for them.

HYDRAULICS Rodgers

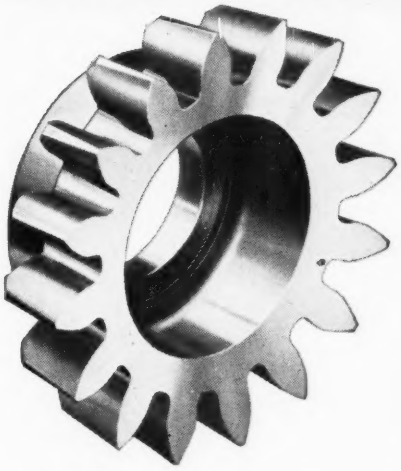
Rodgers Hydraulic, Inc.

7447 Walker St., St. Louis Park, Minneapolis 16, Minn.

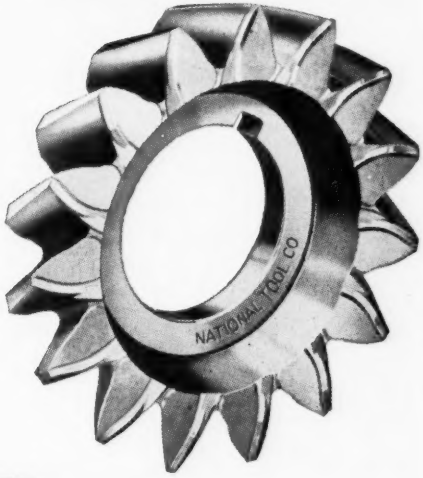
HYDRAULIC POWER EQUIPMENT

For those tough *Special* jobs that just have to be right...depend on

NATIONAL TOOL CO.



Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry



GEAR SHAPER CUTTER and HERRINGBONE GEAR CUTTER custom-engineered to meet the exacting needs of the Gear Industry

A partial list of *special* tools engineered and manufactured by National Tool Company

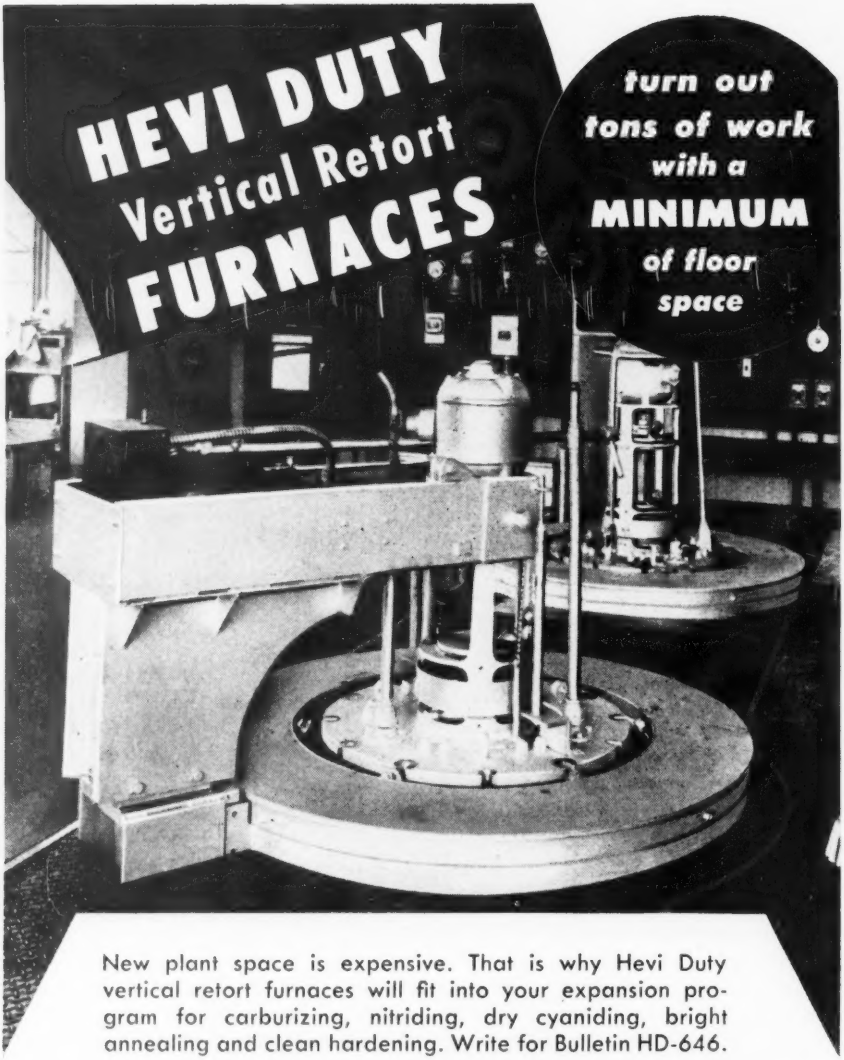
NATIONAL TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers

Gear Shaper Cutters
Herringbone Gear Cutters
Ground and Unground Gear and Spline Hobs
Master Gears
Milling Cutters
Broaches
Tungsten Carbide Tools
Sprocket Cutters
Profile Form Mills
Chamfering Cutters
Rotary Gear Cutters
Circular Form Tools
Gang Cutters
Flat Form Tools

HEVI DUTY Vertical Retort FURNACES

turn out tons of work with a **MINIMUM** *of floor space*



New plant space is expensive. That is why Hevi Duty vertical retort furnaces will fit into your expansion program for carburizing, nitriding, dry cyaniding, bright annealing and clean hardening. Write for Bulletin HD-646.

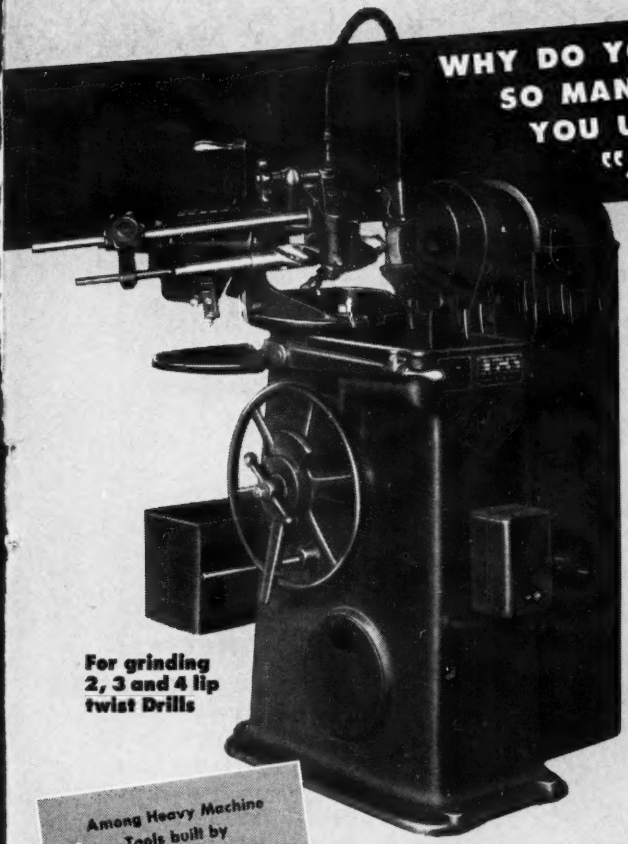
HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

WHY DO YOU SUPPOSE SO MANY OF THE DRILLS YOU USE COME TO YOU "Sellers Ground"?



For grinding 2, 3 and 4 lip twist Drills

It's because... Leading Drill manufacturers use Sellers Drill Grinders to point grind their drills. They also recommend them for maintaining their customers' drills at top efficiency.

SELLERS DRILL GRINDERS CUT DRILLING COSTS THROUGH . . . . INCREASED PRODUCTION. Free cutting, accurate drills permit drilling machines to be operated at their most efficient speeds.

LONGER DRILL LIFE. Less drill material is ground off when re-sharpening drills.

MORE HOLES PER GRIND. Correctly ground drills remain sharp for a greater number of holes.

REDUCED ASSEMBLY COSTS. Eliminates under- and over-size holes. Saves reaming and boring.

RECLAIMS DAMAGED DRILLS. Sellers grinding method reclaims many burned and broken drills that are ordinarily scrapped.

ECONOMICAL. Sellers Grinders have been known to earn their cost as many as six times over within one year. Readily operated by skilled or unskilled operators.

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

SELLERS No. 6-G DRILL GRINDER

A wet grinder especially adapted to grinding high speed twist drills from 1/16" to 3" diameter, this machine provides a distinctly improved method of grinding that produces correctly formed drill points with duplicate lips. It automatically determines proper clearance according to drill size and grinds drills to equal length for use with multiple spindle drilling machines. Among other advantages, this method materially reduces drill maintenance costs. Other Seller Drill Grinders are available in sizes to handle drills down to .028" (No. 70) diameter. Built to last, Sellers Drill Grinders have an unusual record for long operating service, with some in operation for thirty years and longer. With ordinary care, part replacements are negligible, however when required, replacement parts are always available. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

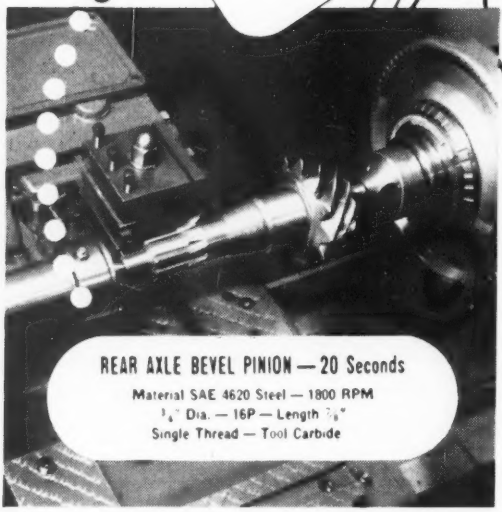
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

YOUR THREADING "ACE"



Can you "top" these threading figures?

WE DOUBT IF YOU CAN TOUCH 'EM! You've got a real "ace up your sleeve" when you've got a Cri-Dan Single Point, High Speed Threading Machine in your shop. **IT'S OBSOLETING** former threading methods everywhere... it produces precision external and internal threads at speeds formerly deemed impossible or impractical. Add to this the features of low average $3.20 tool cost... 15 minute changeover . . . simple controls so average operator can produce perfect threads, and it's definitely "your Threading Ace!"

Contact your Lees-Bradner representative or write direct to

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

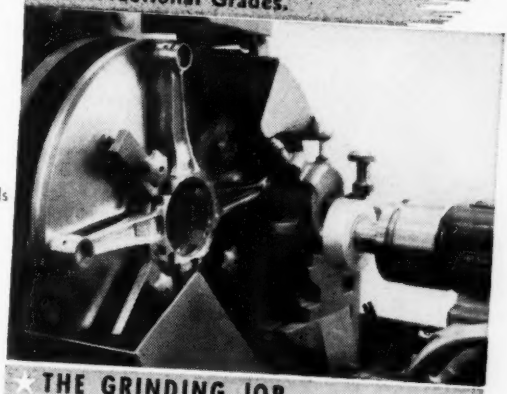
"UP-ING UNCLE'S MUSCLE"

Bay State internal wheels have been "inducted" for a host of Defense Jobs . . .

Aircraft Cylinder Sleeves
Anti-Friction Bearings of All Kinds
Gun Barrels
Propellor Hub Cones
Connecting Rods
Aircraft Crankcase Assemblies
Cartridge Dies
Tank Turret Housings and Shields, etc. etc.

Ask for Bay State engineered-help on your next job.

★ **THE ABRASIVE PRODUCT**
Bay State Internal Wheels . . . Quality Control Manufactured in Fractional Grades.



★ **THE GRINDING JOB**
Internal Grinding Crank Holes in Four Aircraft Conn Rods Simultaneously.

BAY STATE

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

Branch Offices and Warehouses – Chicago, Cleveland, Detroit, Pittsburgh
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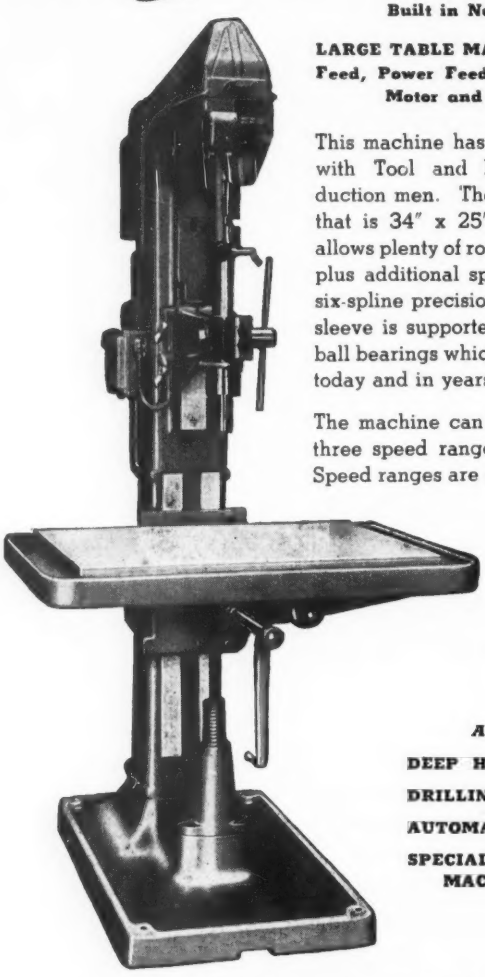
★ KEEP AMERICA STRONG ★

Avey BMA-6 Tool Room Drill

Built in No. 2 and No. 3 Sizes



LARGE TABLE MACHINE having either Hand Feed, Power Feed, *Avey-Matic* or Reversing Motor and Control for Tapping.

This machine has proved to be very popular with Tool and Die Shop men, also production men. The large heavily ribbed table that is 34" x 25", plus ample chip trough, allows plenty of room for large dies or fixtures, plus additional space for tooling, etc. Each six-spline precision ground spindle and drive sleeve is supported by five rows of precision ball bearings which give the precision needed today and in years to come.

The machine can be obtained with either of three speed ranges: low, medium, or high. Speed ranges are easily changeable for future jobs requiring higher or lower speeds, which is a necessity today with ever-changing design. Where power feed is desired four rates of feed are furnished.

Also manufacturers of

DEEP HOLE DRILLING MACHINES

DRILLING AND TAPPING UNITS

AUTOMATIC INDEX TABLES

SPECIAL DRILLING AND TAPPING MACHINES

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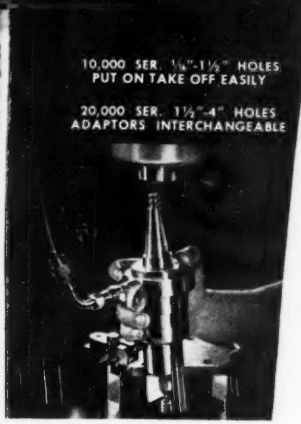
THE AVEY DRILLING MACHINE CO.

CINCINNATI 1, OHIO



JIG GRINDING ACCURACY *guaranteed** with the *Vulcanaire* ATTACHMENT 65,000 R. P. M.

It's built by toolmakers for toolmakers

YOU CAN Place it quickly in the spindle of your jig borer or mill and locate—finish grind holes in hardened steel to "tenths" at speeds controlled at any point from 30,000 to 65,000 R. P. M.

- √ jig grind dowel holes square with a ground base.
- √ move location of holes in hardened steel blocks.
- √ jig grind interchangeable holes in hardened sections.
- √ grind .032 to ⅛" holes with diamond impregnated laps.
- √ grind contours and relief with tungsten carbide burrs.
- √ grind radii in die sections.
- √ jig grind awkwardly shaped components.
- √ eliminate jig bushings in tools where close spacing is essential.
- √ reduce die making time because the jig ground hardened die, stripper plate, and die holder all fit together creating uniform clearance.
- √ jig grind holes from smallest up to 1½" with 10,000 series, and holes from 1½" up to 4" with 20,000 series Vulcanaire.

EASY DOES IT

The system can be used between machines of various capacities.

It is completely portable (all accessories—mist oiler, air filter, pressure gauge, and vacuum dust collector—are platform mounted).

TOPS IN PRECISION!

Precision built throughout. Constructed of alloy and tool steel. Super precision bearings preloaded with our special fixtures.

STRATEGY

The arsenals are buying Vulcanaire Jig Grinders. You, too, can meet the most rigid specifications

- √ with an investment that is less than the cost of a rotary table
- √ and without adding manpower.

Proved 4 years in service by precision manufacturers

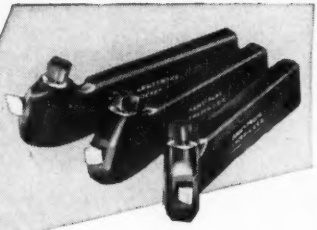
*Dependably accurate to "tenths"

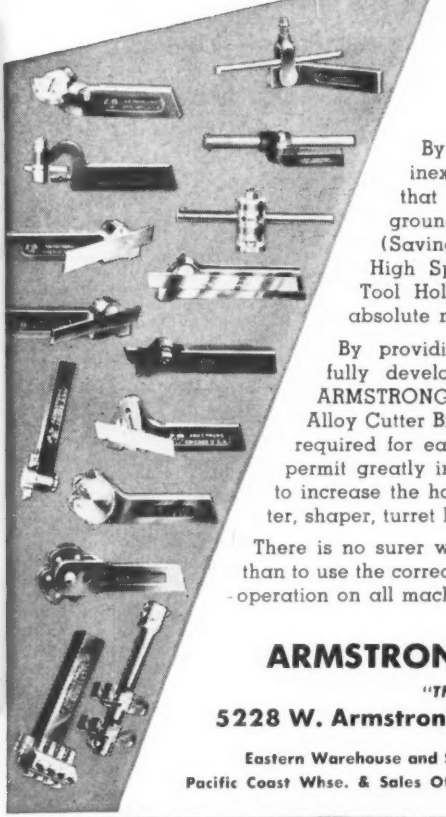
OTHER SPINDLE APPLICATIONS

For quotation and literature, please mention machine tool application. Write Gordon Letsche, Vice President, Vulcan Tool Company, 731 Lorain Ave.

DAYTON, OHIO

ARMSTRONG TOOL HOLDERS





answer both . . .

1. The problem of lowering costs

2. The problem of increasing output

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5228 W. Armstrong Ave. Chicago 30, U.S.A.

Eastern Warehouse and Sales: 199 Lafayette St., N. Y. 12, N. Y.
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, Calif.

FEATURES IN THIS ISSUE

MODERN Machine Shop

JUNE, 1951

Vol. 24, No. 1

Deep Draw and Waffle Forming — *By Gilbert C. Close*

Mr. Close describes the application of the metal forming process whereby a metal sheet is compressed in one direction while being elongated in another to provide for greater deformation of the metal sheet. The design standards covered in this article meet the critical tolerances and safety factors involved in aircraft production which are much higher on the average than the design limitations experienced in many types of industry. Page 90.

Straightening Methods and Equipment, Part IV — *By John E. Hyler*

In this concluding article of the series, Mr. Hyler calls attention to various types of roller leveling machines which are designed primarily for straightening flat stock. Additional types of equipment described include machines for straightening coiled stock, tubes and bars. Page 108.

Ball Extruding Buick Torque Tube Flanges — *By Fred W. Vogel*

This article describes a unique forming operation, the basic idea of which might suggest application to other types of workpieces. Buick has found this ball extruding method particularly helpful in stepping up the production of torque tube flanges. Page 136.

Designing Drawing and Redrawing Dies — *By C. W. Hinman*

The author enumerates the factors which must be considered before a die designer may proceed to the laying out of a drawing or redrawing die. A setup for the drawing and pinch trimming of shells is also described. Page 140.

How to Handle the Manpower Crises — *By Charles Furcolowe*

Along with an ever-increasing number of defense orders has come a greater demand for workers. Practically every industrial area is in need of machinists, die designers, layout men, production men, and so on. To meet this growing need for workers, the author offers a number of practical suggestions which will be of interest to every metalworking shop executive. Page 152.

Special Toolholder Aids in Strain-Gage Measurement of Tool Loads — *By Ira S. Roberts*

This article is a report of the work conducted by engineers of Jones and Lamson Machine Company in preparation for a broad research program on "carbide high-velocity turning." Page 170.

Jigs and Fixtures for Small Lot Production — *By John T. Lancaster*

As a toolmaker of many years experience, Mr. Lancaster explains the kind of reasoning which should influence the selection of a specific design for a jig or fixture. Page 180.

Fitting the Working Space to the Spring — *By Fred Rogers*

This article elaborates on the theme of a spring manufacturer's advertisement in which the suggestion was made to first design the spring and then make the working space fit the spring. Page 214.

How to Drill Cast Iron with Carbide Twist Drills — *By Fred W. Lucht*

A report of comprehensive laboratory tests, followed by actual production applications over extended periods of time, which indicate that cemented carbide twist drills can be used to drill holes in cast iron much more rapidly than with previously used drilling methods. Page 220.

Deep Draw And Waffle Forming

The formulae, design standards and materials listed in this article are now in use at North American Aviation Inc., in the manufacture of high tolerance parts.

By Gilbert C. Close

MANY of the older and more familiar industrial processes are taken for granted now days and employed year after year in the same stereotyped pattern. Having proved their ability to perform one job and do it well, very little thought or study is given to their application on variations of the familiar pattern. This is particularly true of such fundamental old timers as draw forming. Parts are designed for draw forming adhering to old concepts and limitations, and when the design does not fall handily into these preconceived limitations, it is relegated to production by another and often more expensive process.

Few products require more critically formed parts than a modern airplane, so it is only natural that various of the large and progressive airframe producers have given extensive study to metal forming problems. In these studies, the fundamental concepts of draw forming are used as a basis from which deviations are made after thorough scientific and metallurgical studies indicate their practicality. It was because of studies like these that engineers at North American Aviation, Inc., were able to issue an entirely new set of design standards for deep draw and waffle forming that give design engineers far more leeway and assurance of successful results than hitherto enjoyed.

This article deals with the North American studies and results. The same basic information necessary to arrive at the desired results is outlined also. The drawings, tables and symbols used are taken directly from the new design standards and are currently in use by company engineers in the design of parts for deep draw or waffle forming. In all cases these standards meet the critical tolerances and safety factors involved in aircraft production which are much higher on the average than the design limitations experienced in many types of industry.

Process Description

In general, deep draw forming is a process in which a metal sheet is compressed in one direction while being elongated in another. By using compression and elongation together the metal can be deformed to a much greater extent than when it is stretched in one direction only. Because of

this advantage, the drawing process may often be used to form parts which otherwise would be very difficult to fabricate on the hydropress or drop hammer.

The fundamentals of the deep drawing process are illustrated in Fig. 1. A flat blank is placed over a die with the proper shape of opening. A circular part as shown, with a flat bottom, is the easiest and simplest to form. A punch (not shown) forces the center of the blank into the opening in the die. As the material at the center of the blank travels downward into the die, the rest of the material travels inward as indicated by the arrow in Fig. 1B. Considering a wedge-shaped segment AOB of the original blank in Fig. 1A, the outer arc of this segment has a length AB. In the intermediate stage, Fig. 1B, this length has been reduced to A′B′. It is thus obvious that shrinking of the metal must have occurred in the circumferential direction. At the same time the metal was elongated into the verticle wall of the cup.

This shrinking in the circumferential direction introduces a problem of its own, as the thin sheet being formed tends to buckle under compression. It thus becomes necessary to provide a "hold down" ring as shown in Fig. 2. With the proper pressure on this ring, the tendency to wrinkle can be overcome and the material will flow smoothly into the walls of the cup. Only the minimum required pressure should be applied on the hold down ring to prevent undue friction during metal flow, and even then a good grade of forming lubricant should be used.

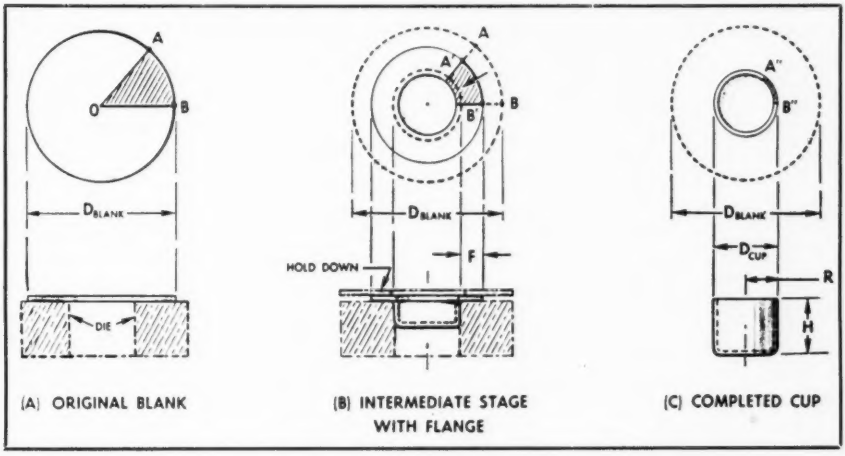


Fig. 1—Basic drawing process.

The same basic principles of draw forming may be applied to parts which are made up of segments of cups, such as boxes with rounded corners as shown in Fig. 3B. Dome shaped parts may be drawn using a hold down ring, although some difficulty is involved unless the radius of the dome exceeds

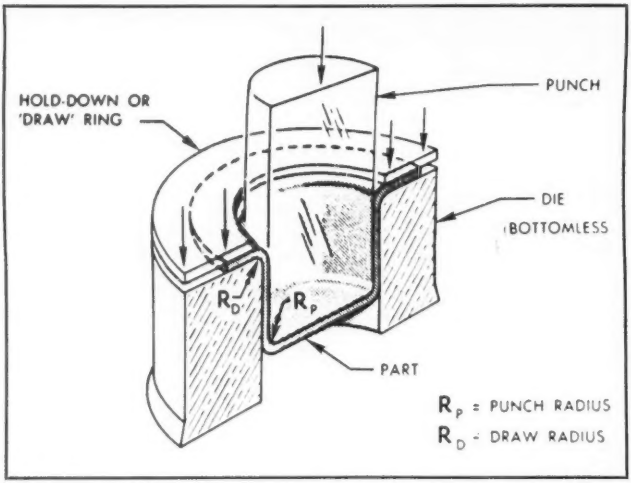


Fig. 2—Schematic assembly of die, hold-down ring and punch.

material thickness at least 75 times. A smaller proportional radius may cause puckering to occur.

Press Equipment Required

The most flexible arrangement for deep drawing of sheet metal is a double acting press with an independently actuated ram to exert pressure on the hold-down ring. Several such presses are in use at North American Aviation. Other presses used are single-acting hydraulic and crank-presses with air cushions for operating the hold-down device. A simple single acting crank-press can be used by designing the die itself so as to contain a spring-mounted draw ring which is energized by the action of the main ram. The single acting press in conjunction with these special dies produces at the fastest rate, but usually the die cost is much higher than when used on a double acting press.

Tooling

While draw dies are usually expensive when designed for mass production use, much of this expense can be eliminated when the die is intended for limited use. Limited use is generally the rule in aircraft production, and limited use tooling can be a money-saver in many specific cases. North American engineers have found that Kirksite, Masonite, or even plastics will give adequate life in many cases. Hold down rings also may be made of Kirksite. Expensive steel mating dies should be used only where long-run production will justify the costs.

As evidence of such cost-saving possibilities, an ash tray for airplane cabin use was estimated for production on steel mating dies to be made at a cost of approximately 700 hours. As actually produced, however, the entire contact was run off on two dies, a round-dome first form die, and a Kirksite finish form die made in 60 hours. To make this possible, the design of the part was modified slightly to increase the corner radii. Thus it is obvious that proper design of draw formed parts is important to reduce both the number of dies required and the number of operations necessary.

Advantages of Deep Drawing

The new North American design standards set forth specifically the advantages and disadvantages of deep

draw forming to guide design engineers in the proper selection of the fabrication process. These are as follow:

Advantages:

(1) Deeply cupped parts are formable in one operation and in one piece, thus eliminating auxiliary operations such as annealing, welding, and so on.

(2) Parts are identical and accurately reproduced. Hand re-work can be largely eliminated.

(3) Parts can be produced rapidly once the set-up is correctly made.

Disadvantages:

(1) Set-up and tool design times are greater than for alternative processes such as making the part in sections on the hydropress or drop hammer.

(2) Lubrication and press adjustments are critical.

(3) Design limitations must be adhered to closely.

Applicable Materials

Common materials best suited to deep draw forming include the soft aluminum alloys (2SO, 3SO, 52SO, 3S½H) and the steels (carbon and stainless). Aluminum alloy 24SO can be drawn into simple cylindrical cups, but has less favorable formability for boxes and domes. Copper and brass in sheet form can be readily drawn.

Limits of Draw Forming

The chart in Fig. 4 shows the practical limits for single operation forming of cups and boxes. These data were accumulated by extensive experiments conducted under production conditions. In the chart, a reasonable margin is provided to cover possible variations in material properties and production techniques. The data are presented in non-dimensional form (i.e., in terms of ratios).

Design for Draw Forming

Actual design data accumulated by North American engineers are as follow:

(1) Approach the cylindrical as closely as possible if maximum depth is required.

(2) Minimize flange widths, especially adjacent to critical draws, since the width of the flange must be counted as part of the draw. On boxes, eliminate flanges as sharp corners are possible as shown in Fig. 5A.

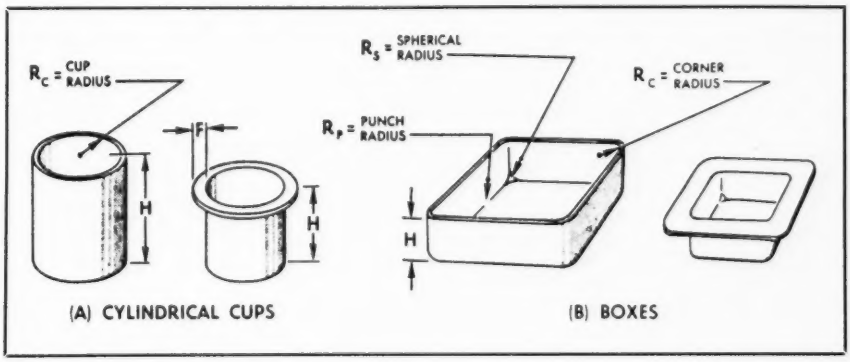


Fig. 3—Basic shapes which can be drawn.

SQUARE BOX

$W = W_1 = W_2$

RECTANGULAR BOX

$W = \sqrt{W_1 \times W_2}$

IF $W_2 / W_1 > 3$ Limitations more severe

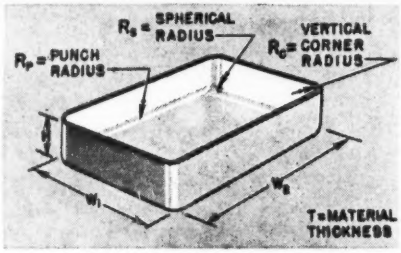
IRREGULAR PART

$W = \sqrt{\text{Projected bottom area}}$

FLANGED BOX (flange F" wide)

$H_{effective} = H_{actual} + F$

(That is, when limiting depth for a given corner radius is read from the chart, deduct flange width to get actual allowable part depth.)



HEMISPHERICAL BOTTOMS

Use chart for 'Drawn Boxes' ($R_s = R_c$)

Use $H_{effective} = H_{actual} - \frac{1}{2} R_s$

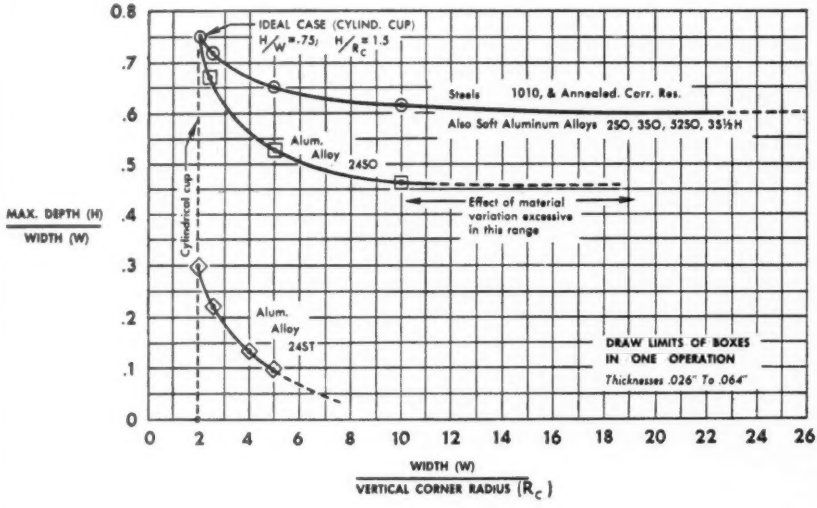

IDEAL CASE (CYLIND. CUP) H/W=.75; H/Rc=1.5
Steels 1010, & Annealed. Corr. Res.
Also Soft Aluminum Alloys 250, 350, 3250, 35½H
Alum. Alloy 2450
Effect of material variation excessive in this range
Cylindrical cup
Alum. Alloy 24ST
DRAW LIMITS OF BOXES IN ONE OPERATION
Thicknesses .026" To .064"
MAX. DEPTH (H) / WIDTH (W)
WIDTH (W) / VERTICAL CORNER RADIUS (Rc)
0.8
.7
.6
.5
.4
.3
.2
.1
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26

Fig. 4—Chart showing practical limits for single operation forming of cups and boxes.

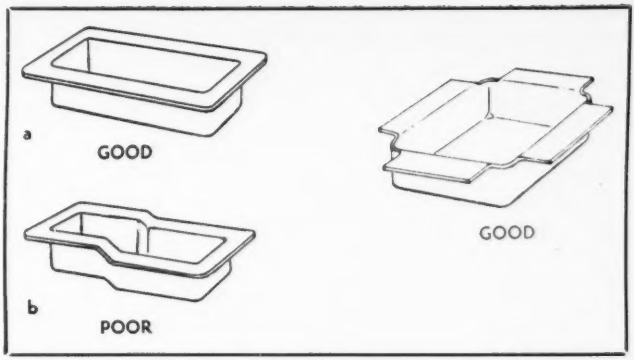


Fig. 5—Examples of good and poor design for draw forming.

(3) Design for maximum possible symmetry—equal-depth draws throughout, uniform sections, flat planes, no excessive local draws. (See Fig. 5A.)

(4) Use radii in accordance with the following rules: (See Figs. 2 and 4 for nomenclature)

Rc Never less than 5t
Rp Never less than 5t
Rd Minimum = 5t
Recommended = 8t
Maximum = 10t
Rs Not less than 10t or 2Rc

(5) Avoid draw depths requiring multiple operations. Such operations increase tool costs and, in the case of aluminum alloys, have a questionable effect on the properties of the material.

(6) Shape parts in such a manner that they can be withdrawn freely from the dies after forming.

(7) For hemispherical domes, make the bottom radius Rb (Fig. 4) less than 75t unless mating dies are contemplated. Such a radius will eliminate the tendency to pucker.

(8) Where possible, specify that slight wrinkles (.010 max. depth) are permissible in the flanges of the drawn part; and that distortion in like amounts is permissible in the flat sides or over a hemispherical dome.

(9) Look for opportunities to design odd-shaped parts in such a way that they can be cut from deep drawn cups or boxes.

Drawing vs. Stretching

In all cases, design engineers are advised to make use of the deep forming principle and avoid forming by stretching alone. Too much pressure on the

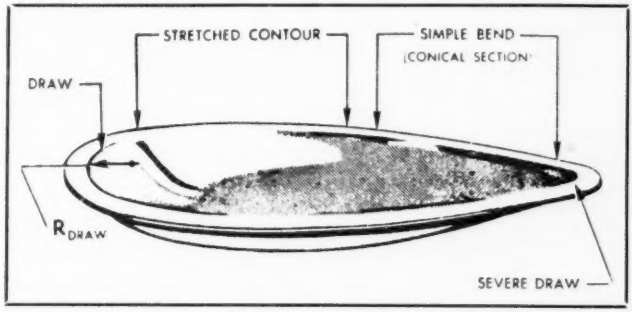


Fig. 6—Location of the various forming operations involved in drawing the half-shell for a droppable fuel tank.

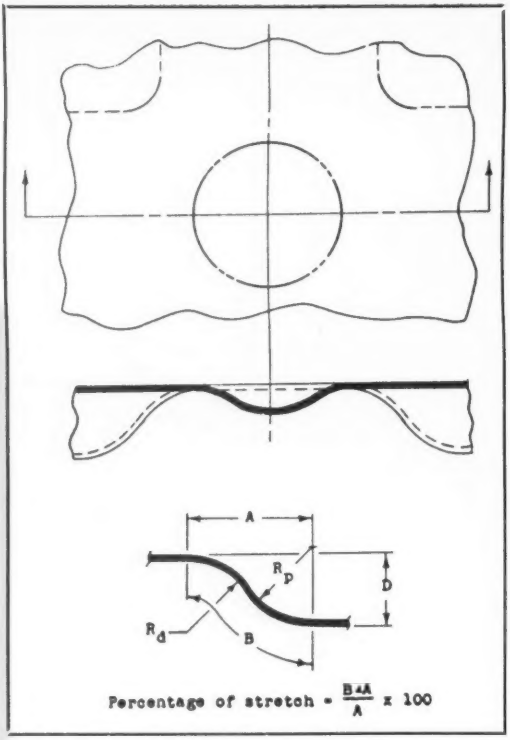


Fig. 7—(Above) Use of additional cups where possible to absorb excess material. (Below) Calculations used in determining amount of internal stretch.

hold down ring will increase the tendency to stretch form, and failure may occur before the part has reached the desired shape. Pressure on the hold down ring is particularly critical near the corner sections of boxes where unless the metal can flow freely, overstretching will result.

In some parts, it is feasible to combine both draw forming and stretching in a single operation. In this case, the stretch forming is merely an outcome of part design and its position between the forming dies. No separate operation is required. A good example in this case is the half shell for a droppable fuel tank shown in Fig. 6. The stresses that cause metal flow during forming of this part are shown in the diagram. By skillful use of a double-acting press with hydraulically actuated hold-down rams, the pressure on the draw plate is varied to permit drawing to occur at the nose and tail, while stretching and simple bending take place elsewhere.

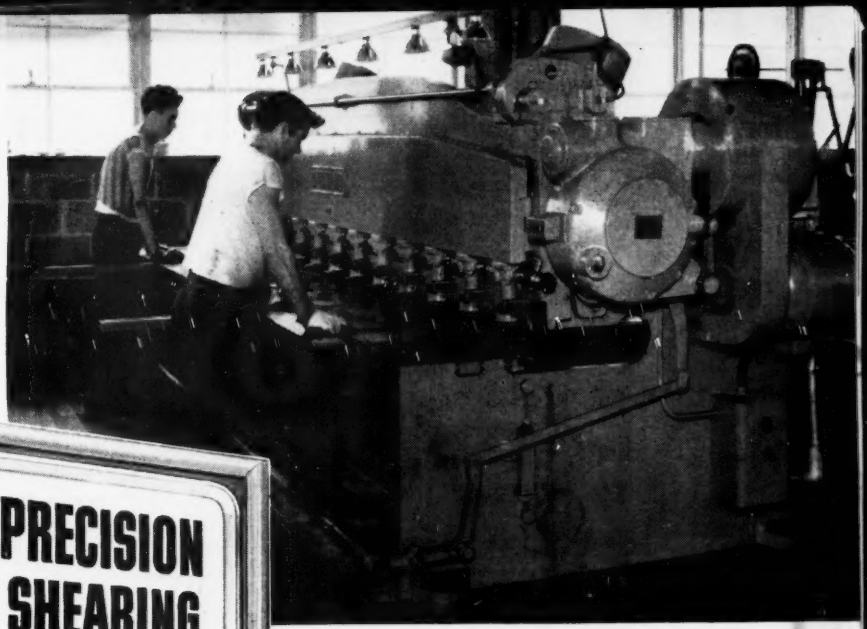
Drop Hammer Draw Forming

A kind of drop hammer draw forming can be accomplished on the hammer by using plywood rings so stacked on the blank that the overhanging shoulder on the punch strikes against them at the same instant that the main portion of the punch pushes the sheet into the cavity. A restraining action tending to control buckling is thus obtained, but great skill on the part of the operator is required due to the brief duration of contact. The plywood rings are removed one at a time after each hit until the final shape is obtained. This practice is limited to shapes where flat plane flanges are used.

An alternate to the plywood method is the multistage drop hammer die. As the part is formed, it is advanced from stage to stage, usually built in the same die, thus keeping severe wrinkling under control.

Waffle Forming

Multicellular structural units formed from sheet metal on the drop ham-



Photos courtesy Rex Engineering Company.

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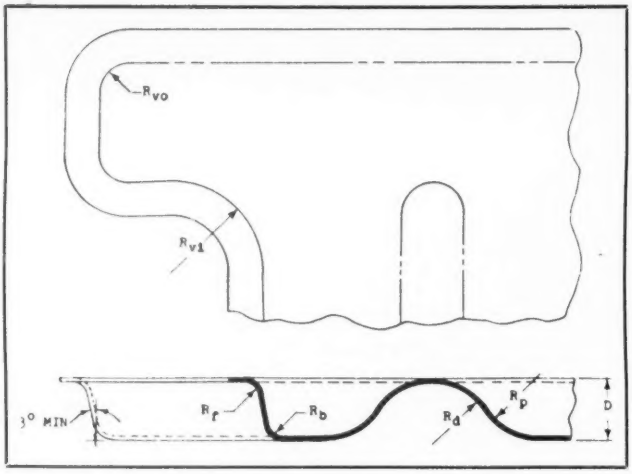


Fig. 8—Nomenclature for using waffle forming calculations.

mer can be designed to replace an assembly of many pieces of channels, stiffeners and gussets riveted together. Such structures are rigid and light in weight. The waffle effect of the formed metal, with its greatest rigidity lying in many planes, gives such a part very good strength. In general, such waffle-formed parts can be produced at much less cost than riveted assemblies, and once the set-up is made, can be turned out in great quantity.

Waffle forming is adaptable in many types of structures such as entrance doors (airplane), landing gear doors, cowling, cooling flaps, etc. Its chief disadvantage is that, due to the tolerances incurred in drop hammer forming, it is difficult to provide for load transmission through concentrated areas into the adjacent structure. For example, hinges and latches on opposite sides of a door cannot be consistently located from the waffle. Acceptable bending loads must be lighter because the structural continuity is broken up at intersections of the waffle elements, but this may be overcome to some extent by staggering intersections.

Cost comparisons between waffle formed structures and built-up structures for the same purpose are very favorable toward the former. An inner door section being produced in the North American shops, itemized as to costs, shows the following relevant savings:

	Built-Up Frame	Waffle Formed
Material	$ 2.45	$ 5.50
Labor and Burden	19.75	6.15
Total	$ 22.20	$ 11.65
Tools	$1350.00	$ 950.00

Applicable Materials

Materials which can be waffle-formed with success include 2SO, 3SO, 52SO, 61SO and 24SO aluminum alloys in gauges from .025 to .091, and annealed corrosion resistant steels in gauges .018 to .063. Best results are obtained with all materials when the thickness ranges from .040 to .051 in gauge.

Advantages and Disadvantages

Much as with deep draw forming, the North American design standards is very specific concerning the advantages and disadvantages of waffle forming. In general, these cover:

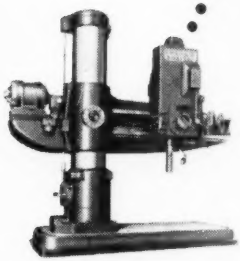
Advantages:

(1) Tooling cost is not excessive for small run quantities.

Fewer Controls

1. 3 levers control 36 spindle speeds.
2. 2 levers control 18 feeds (sliding gears)
3. One convenient panel for driving motor control, column clamping and unclamping control.
4. One directional lever, controls — arm elevating, lowering, clamping and unclamping, also automatic pressure lubrication of column.
5. Power rapid traverse of the head in either direction by single lever.
6. Speed clutch control—spindle start, stop and reverse by one lever.

and all at the Head



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(2) Difficult contours and mold-line contours can be cheaply reproduced through the die making process.

(3) Two or more pieces of an assembly, or of parts with difficult compound contours can be combined into one with resultant simplet structure.

(4) Combining parts greatly simplifies both fabrication and assembly tooling and the use of waffles instead of built-up channels and gussets eliminates the many router blocks, form dies and joggle dies required for detail manufacture.

Disadvantages:

(1) Although mold-line contours can be as accurately held as by any other methods of fabrication, the tolerance of the internal elements is not as close and consistent location of attachment points is difficult.

(2) Structural discontinuity through the intersections of formed elements of waffles makes for lighter acceptable bending loads.

(3) After-form trim jigs or hand trimming is usually necessary, especially on larger frames and waffles.

(4) A high degree of operator skill is necessary.

Design for Waffle Forming

In designing waffle shapes the same elements of design are present as for all drop-hammer forming. These include:

(1) Draft angle should be as large as possible. A minimum of 3 degrees may be used where the wall is adjacent to the outline of the part and material is available for the draw.

(2) Internal features may be formed by stretching only. This stretch is calculated as shown in Fig. 7, and should not exceed 30 per cent for 2SO, 3SO and annealed stainless steel, or 20 per cent for 52SO, 61-SO and 24SO. Avoid excessive localized draws and design to distribute stretch over a wide area.

(3) Use materials in the optimum gauge (.040 to .051) wherever possible. This will minimize wrinkling and hand finishing.

(4) Use radii as follows: (See Fig. 8 for nomenclature)

Rvo—Not less than ½D

Rvi—Included angles greater than 90 degrees—½D min.
Included angles less than 90 degrees—1½D min.

Rf—5t where D is less than 1 in.
8t where D is greater than 1 in.

Rb—3t where D is less than 1 in.
8t where D is greater than 1 in.

Rp & Rd Equal to D

(5) Allow as much for wrinkles as is possible.

(6) Provide optional use of cups of bubbles to absorb excess material. (See Fig. 7)

Summary

The formulae, design standards and materials listed in this article are now in use at North American Aviation, Inc., in the manufacture of high tolerance parts for aircraft fabrication. Much of the data were developed experimentally, but has since been proven in production. It should be noted that the recommended design data is intended for formed parts that must meet stringently high specifications. With this fact in mind, considerable leeway in application of the limitations would be permissible in designing of less critical components.

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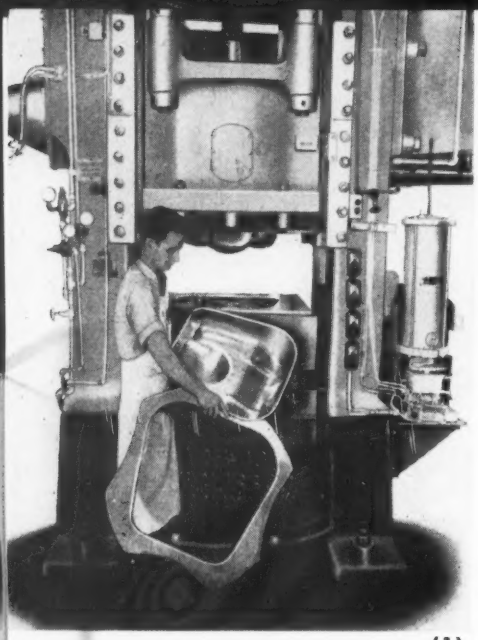
DEEP DRAW and WAFFLE FORMING



(1)

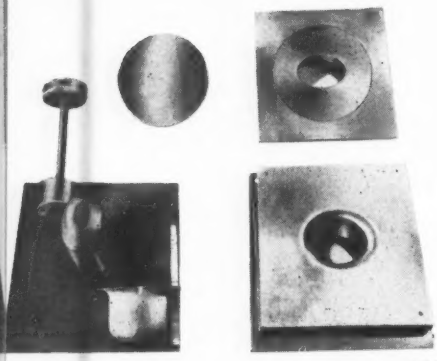
A pictorial spread which serves to illustrate the variety of parts which may be formed by the method described in article beginning page 90.

(1) Double acting press with part and trim.

(2) Preliminary tools for the multiple stage drawing of a rocket fairing. Blank and incompletely formed part are shown.

(3) Waffle formed cowl stamping formed on the drop hammer.

(4) Inner stamping for a main entrance door on airplane.



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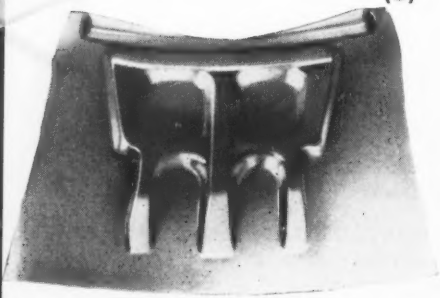

(4)

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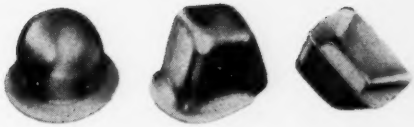


(6)

(5) Multi-stage hammer drawn part.

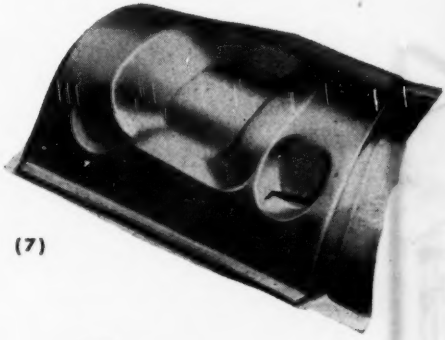
(6) Ash tray formed in two stages on Kirksite punch press dies.

(7) Internal features are formed by stretching only and must be controlled so that ruptures such as this do not occur.

(8) Very thin material such as this buckled easily during waffle forming.

(9) Examples of oddly shaped parts which may be cut from drawn shapes.

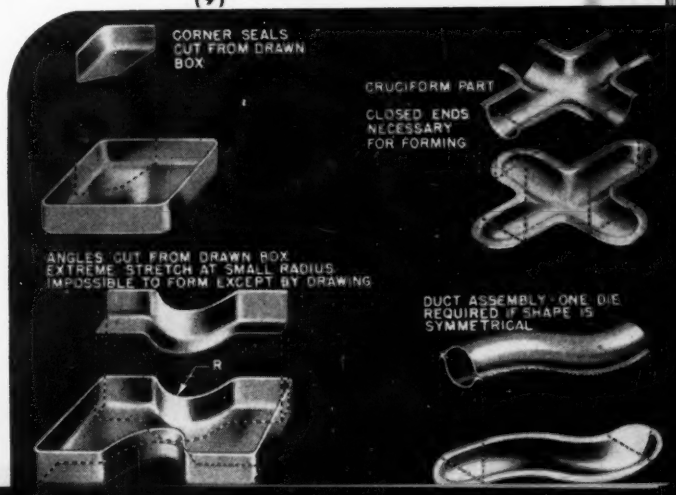
(10) Final die and part for rocket. The difficulty of using any other method and the large quantity involved justified the complex tooling.



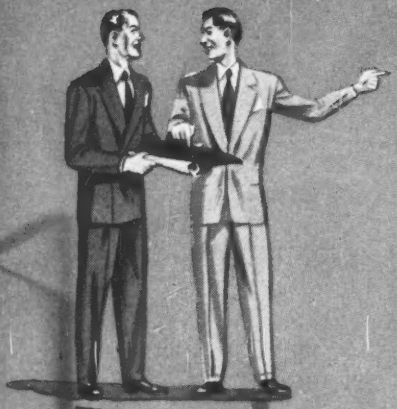
(7)

(8)

(9)


CORNER SEALS CUT FROM DRAWN BOX
CRUCIFORM PART
CLOSED ENDS NECESSARY FOR FORMING
ANGLES CUT FROM DRAWN BOX. EXTREME STRETCH AT SMALL RADIUS. IMPOSSIBLE TO FORM EXCEPT BY DRAWING
R
DUCT ASSEMBLY - ONE DIE REQUIRED IF SHAPE IS SYMMETRICAL

(10)



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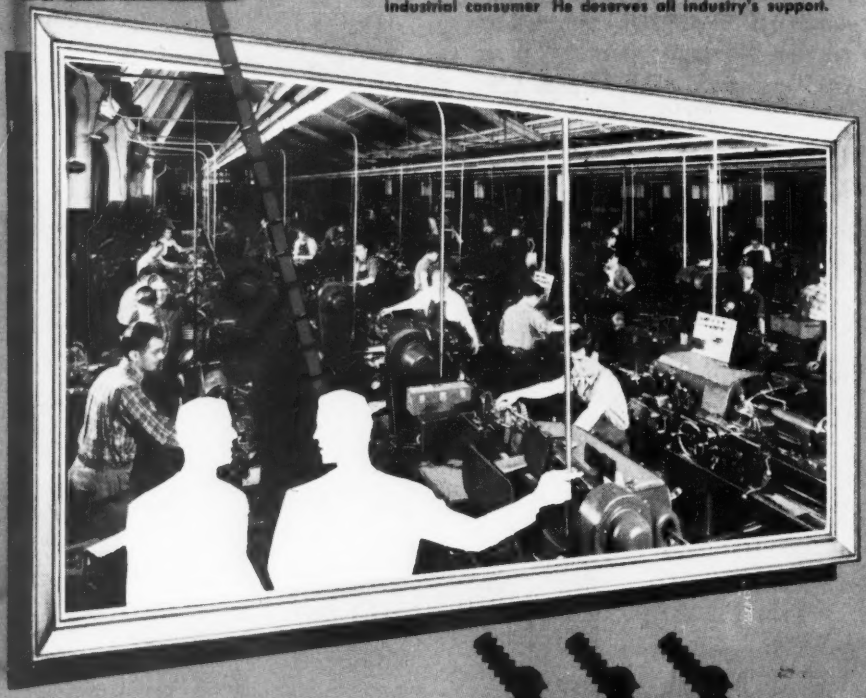

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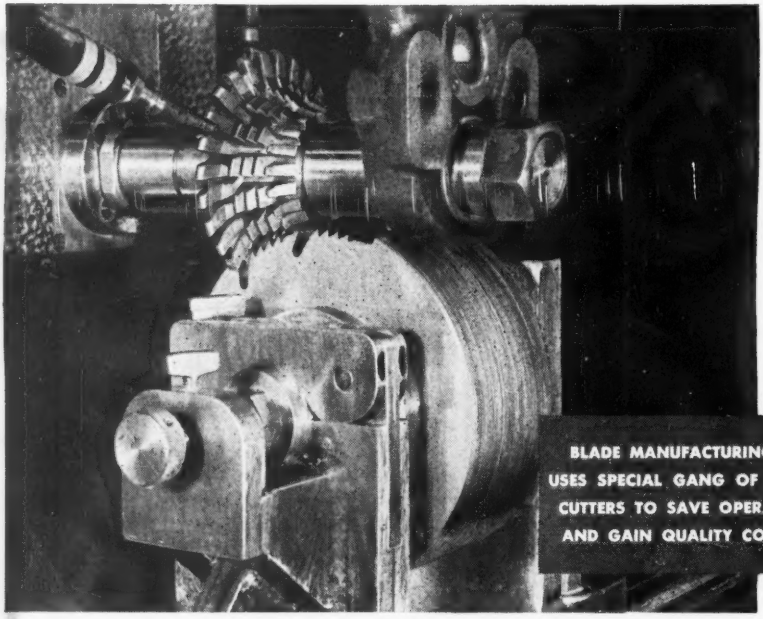

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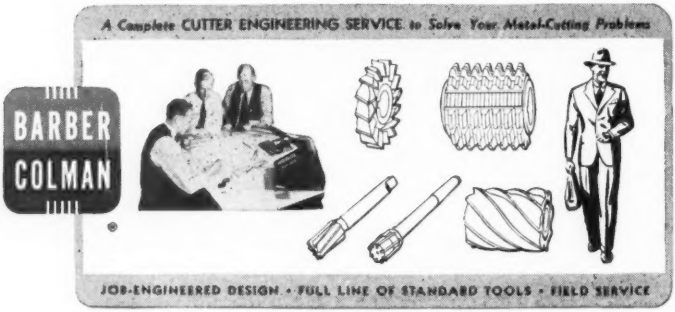
● Barber-Colman job-engineered formed cutters save time and extra operations by combining complex forms into a single cutter or gang of cutters. This makes it possible to reduce the number of individual cutters needed on many milling operations and often gives you one or two "bonus" operations along with a regular "pay cut".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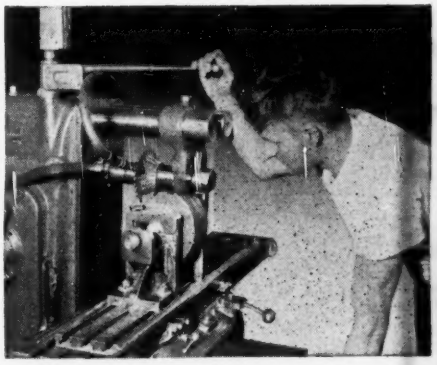
This special gang of Barber-Colman Formed Cutters mills 50 circular saw blade blanks at one time. The teeth and clearance slots are milled together in a single operation. This maintains uniformity and avoids stresses which formerly caused breakage during the "setting" operation. This customer pays for only one operation and receives three free ones with it.

In many cases, Barber-Colman special formed cutters actually give you *extra production operations* without increased cost. A single formed milling cutter may not only produce complex, irregular forms in a single cut, but also include extra milling operations normally performed separately. As a result, production and set-up time on a particular piece may be cut in half or a third. At the same time, inspection is speeded through more consistent uniformity.

Specify Barber-Colman Special Formed Cutters on your next production milling problem, and take advantage of the free operations which can be obtained without extra cost. Send your part prints to the Barber-Colman Cutter Engineering Department and see whether you can't "pool" two or three operations into a single Formed Cutter.



Tool steel blanks are mounted 50 on an arbor and clamped in an indexing fixture. Form Cutters mill one position, and after cut is completed, the fixture is indexed to the next position.

Cutters mill 600–800 blanks before resharpening. Relieved form assures cutting duplication throughout the life of the cutters.

This saw blade manufacturer reports that his customers are well satisfied with the long tool life and elimination of tooth breakage in blades milled by these cutters.

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STRAIGHTENING METHODS AND EQUIPMENT

Part IV

In which the author describes equipment for straightening flat stock, coiled stock, tubes and bars.

By JOHN E. HYLER

ROLLER leveling machines have been employed in various ways for leveling and straightening flat-rolled metals ever since rolling mills were first developed. Improvements in this class of machines have fully kept pace with rolling mill practice in general. The method is really based on gag-straightening practice, though it is progressive. One series of horizontal and parallel rolls is arranged so the top surfaces of all lie in a common plane. Sheet material being straightened or leveled travels over the tops of these rolls. Located above is a second series of rollers, also arranged with all roll axes in a common plane. All axes of both series of rolls are parallel, but rolls in the top series are positionally staggered in relationship to those in the lower series.

Thus, a sheet of material passing over the lower series and under the upper series has multiple line pressure put upon each of its sides by rolls at points midway between each pair of

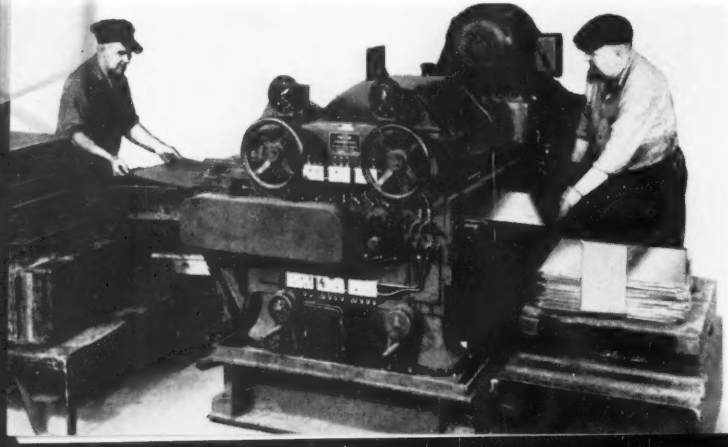

Fig. 1 — Illustration showing a roller-type sheet leveler in use at the plant of Newark Stove Company, Newark, Ohio. This machine, in addition to straightening, improves the grain structure of the steel, making it far more amenable to deep drawing work. Illustration courtesy of the McKay Machine Company.

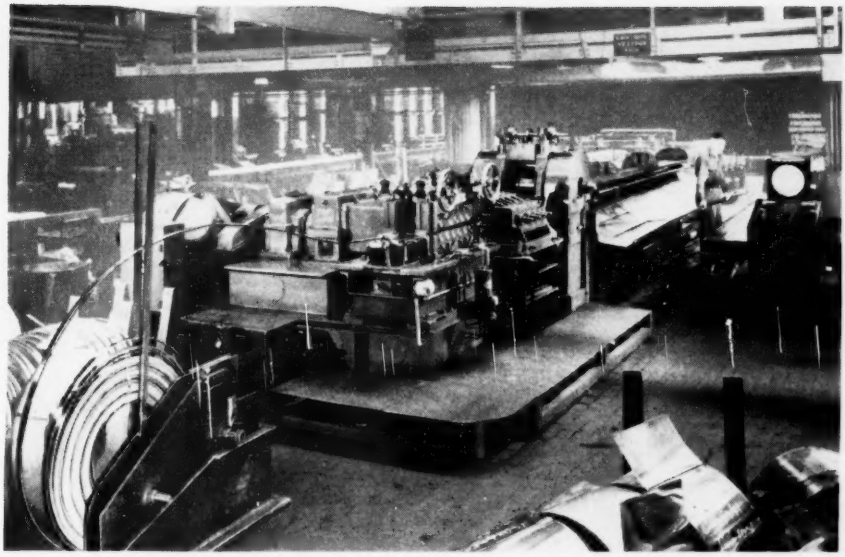

Fig. 2—An interesting line of machines for straightening and cutting up steel strip. In the left foreground is a coil cradle, feeding strip into a 9-roll leveler with entry guide rollers and entry pinch rolls. Leaving the leveler, the strip passes on through a 9-roll edge-straightening unit, and into an automatic drum type flying cutoff with a runout table. This machine line allows of straightening and cutting strip to length in cross-sectional sizes from ½ in. to 2½ in. wide, in any thickness up to a maximum of ¼ inch. It may be cut to any length from 2 feet up to a maximum of 20 feet. Illustration courtesy The McKay Machine Company.

rolls in opposing series. That is to say, a sheet of material passing through the machine is forced to assume a slightly-serpentine path, thickness wise, on its way through. Facilities are provided for adjusting the height of one series of rollers relative to the other.

By use of this adjustment, a leveler can not only be set to accommodate dif-

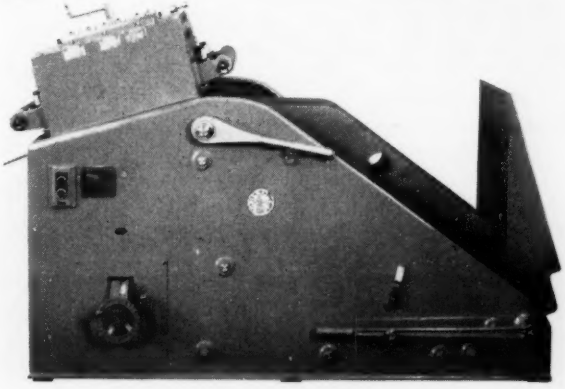

Fig. 3 — This illustration shows a combination cradle reel and power straightener for strip stock, for use in feeding such material to the press. The straightening head is inclined approximately 15 degrees from horizontal to reduce to a minimum the distance normally required between the straightener and press feed units, thus conserving floor space. Illustration courtesy Henry & Wright Division of Emhart Manufacturing Company.

ferent thicknesses of sheet material for straightening, but the **precise** amount of roller pressure put on material passing through can be adjusted. The general idea is to apply **just** enough roll pressure that material will be flexed

ward thinner and thinner gauges, it takes on additional flexibility before its elastic limit is reached. Consequently, for relatively thick material, leveler rollers may be of quite large diameter and spaced fairly well apart. For thin-

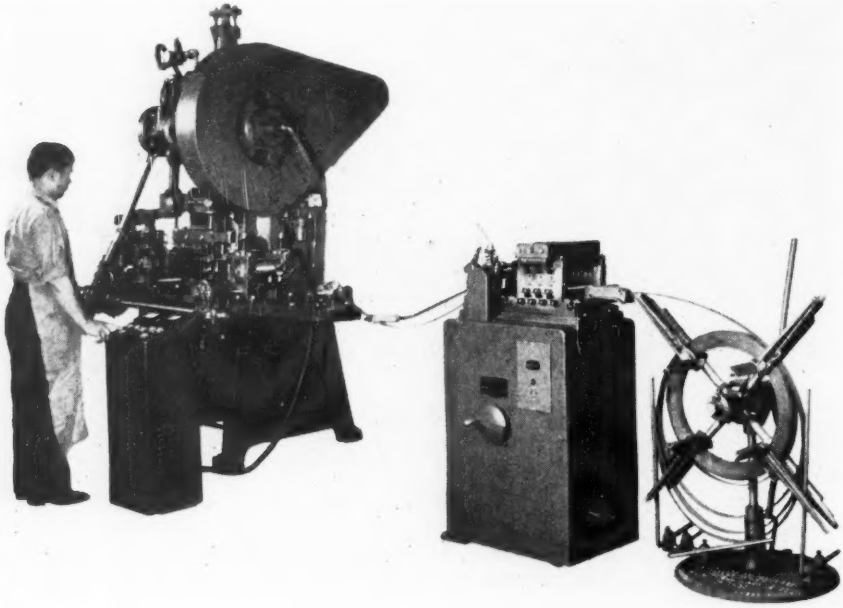

Fig. 4—Shown here is a coil of strip stock being fed from an automatic reel into and through a straightening unit of multiple-roller type, then on into the automatic feed of a punch press. Stock is pulled through the straightening rolls by a pair of pinch rolls provided for the purpose. Different straighteners of this type can be provided to meet any shop conditions likely to be encountered. Layouts using the same kind of automatic reels and strip straighteners can be and are provided for feeding a trip shear, so strip stock can be straightened and cut to desired length in any given shop, though certain additional equipment must be arranged in connection. Illustration courtesy F. J. Littell Machine Company.

barely beyond its elastic limit over both full surfaces, again and again, on its way through the unit. Thus, the material is not only forced to come into general agreement with a true plane, but is worked enough on its way through to cause retention of its flatness upon emergence from the machine.

As sheet material is graduated to-

ner stock, the pressure rollers must be made small enough in diameter to allow their succeeding stock-contact lines to be spaced much closer together. Because such smaller-diameter rolls are subject to much-more-ready deflection, roller levelers for processing thinner stock are of necessity made with "back-up" rollers.

That is, in addition to the closely-

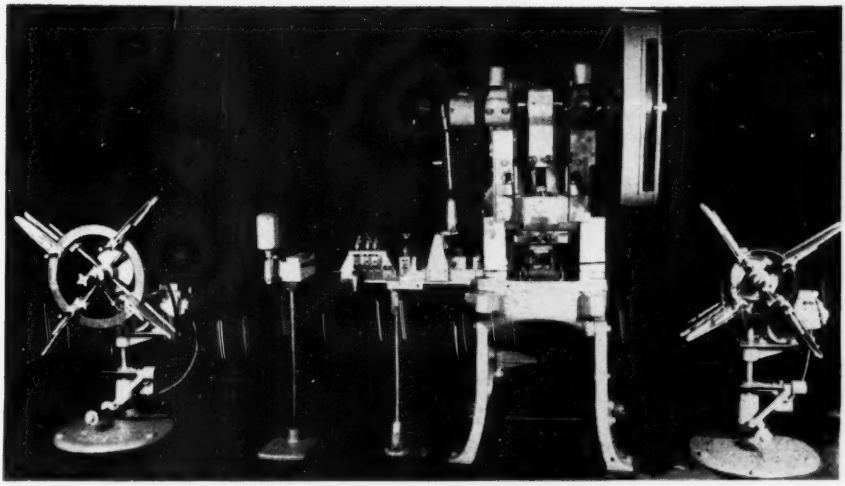

Fig. 5—Showing a punch press arranged with U. S. slide feed and a plain stock straightener. In addition, the setup includes a U. S. stock oiler and wiper, and two automatic stock reels. One of the reels is employed for unwinding and the other for winding up the scrap behind the machine. A layout like this converts the press into an automatic machine. The straightener used has two vertical-axis guide rolls which can be adjusted to suit the width of stock being fed. Illustration courtesy U. S. Tool Company, Incorporated.

spaced small-diameter rollers actually contacting material being leveled, there are rollers of similar diameter set above and in contact with them, each back-up roll being set into the "crotch" of two rollers below. Thus, the strength of the back-up rolls, (which revolve freely with the contacting rollers) is added to the contact rolls. In this way, it is not possible for deflection to take place in the actual leveling rolls unless and until the "back-up" rollers are deflected along with them.

While such machines are chiefly

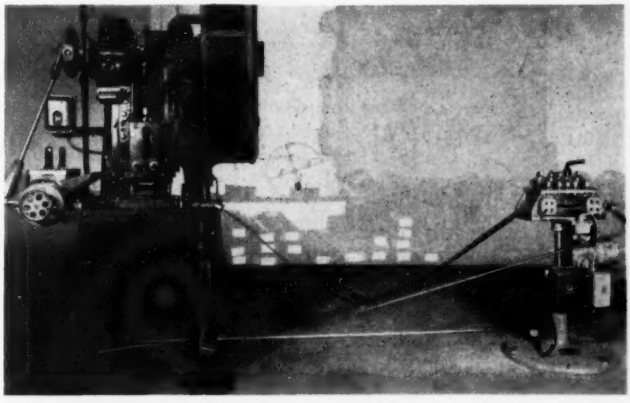

Fig. 6—At the right is seen a light-duty power-driven straightener suitable for strip material up to .090 in. thick x 6 in. wide maximum. It is used in conjunction with a press equipped with a U. S. roll feed. The feed in this case is from right to left. Illustration courtesy U. S. Tool Company, Incorporated.

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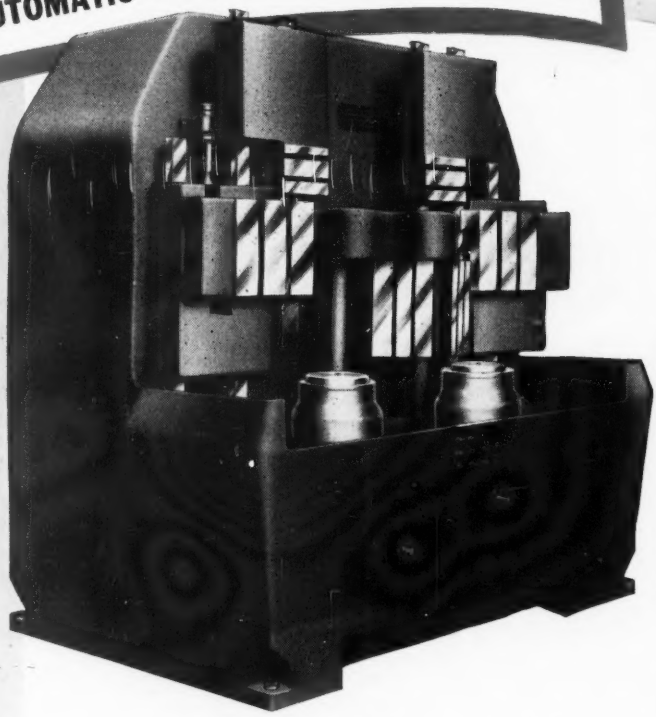
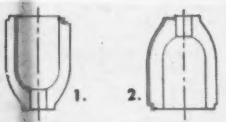




2-SPINDLE MACHINE

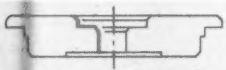
No. 1 — on one spindle
No. 2 — on other spindle
PART—3" dia. shell

— No. 1 —

Operation — Contour bore I. D.
Turn step on O. D.
Face open end
Estimated production — 137 per hr. @ 100%

— No. 2 —

Operation — Contour turn O. D.
Face other end
Estimated production — 137 per hr. @ 100%



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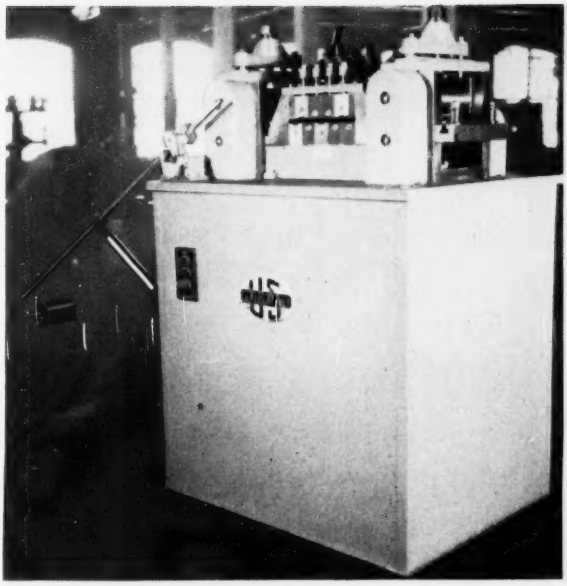

Fig. 7—A pedestal type of multiple - roller strip-stock straightener for use in connection with press feed and similar duty, equipped with a mercury switch for maintenance of a suitable loop of stock between the straightener and the machine feed. Illustration courtesy U. S. Tool Company, Incorporated.

used in steel mills, they are also found in operation in processing plants. One reason is that they improve grain structure of metal by uniforming it at the same time they are straightening. The Newark Stove Company, of Newark, Ohio, for instance, was having difficulty in deep drawing certain parts of their ranges. They found the grain structure of the steel to be too irregular, due to aging. This caused stretcher strain and breakage in the draw. By running their steel through a roller leveler first, it was found to take the draw more easily, without a trace of stretcher strain.

Coiled Stock Straighteners

Various types of material used in the metal-working industries must be coiled for convenient handling, storage and transportation. So definite and far-reaching are the many economic factors which require coiling of wire and strip stock, for instance, that any other method of procedure is definitely "out". But coiled material definitely takes a set, and is not straight when it comes from the coil. This is the basic reason for development of several types of straightening machines.

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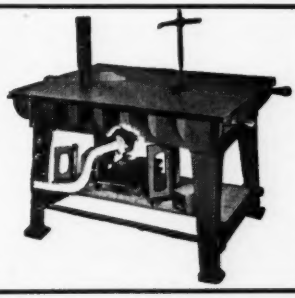

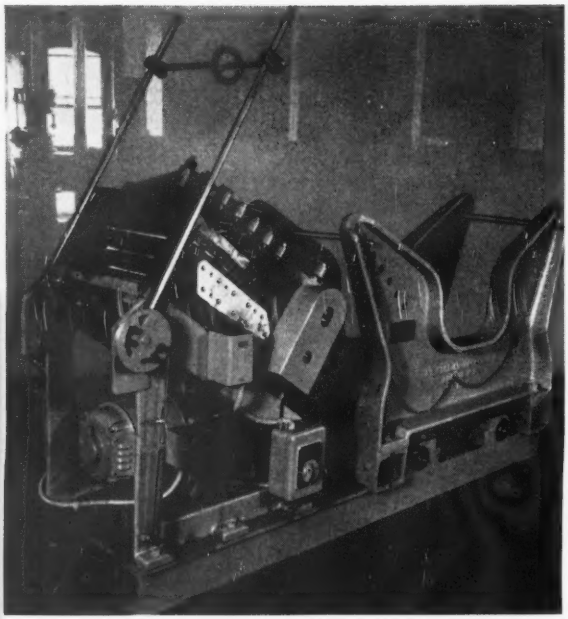

Fig. 8—Illustration showing a combination coil cradle and power-driven straightener suitable for handling and straightening strip stock up to 12 inches wide. This unit will competently handle and straighten large, heavy coils of stock such as are now being used in metal fabricating plants. Illustration courtesy U. S. Tool Company, Incorporated.

Straightening layouts for strip material are found both in the mills and in metal-processing plants. Where mills have large orders to be filled for pieces of strip to length dimensions which can well be handled and shipped in straight lengths, a line of machines is rigged up which will take strip from the coil, straighten it both flatwise and edgewise, and cut it to length. The material is held in a coil cradle for processing. Many times, it is processed from there through a roller leveler similar to those used for sheet stock, though narrower. Then it passes directly on through an edge straightener, and from there into some type of flying cutoff unit. There are different strip straightening setups, depending on the particular problem involved.

Where strip stock is being fed progressively to a blanking press, it is ordinary practice to provide a coil cradle for heavy wide stock, or an automatic reel in the case of lighter material, and process the material through a straightening unit enroute

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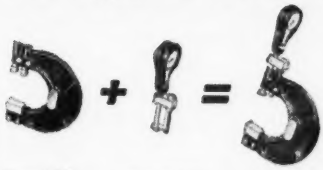

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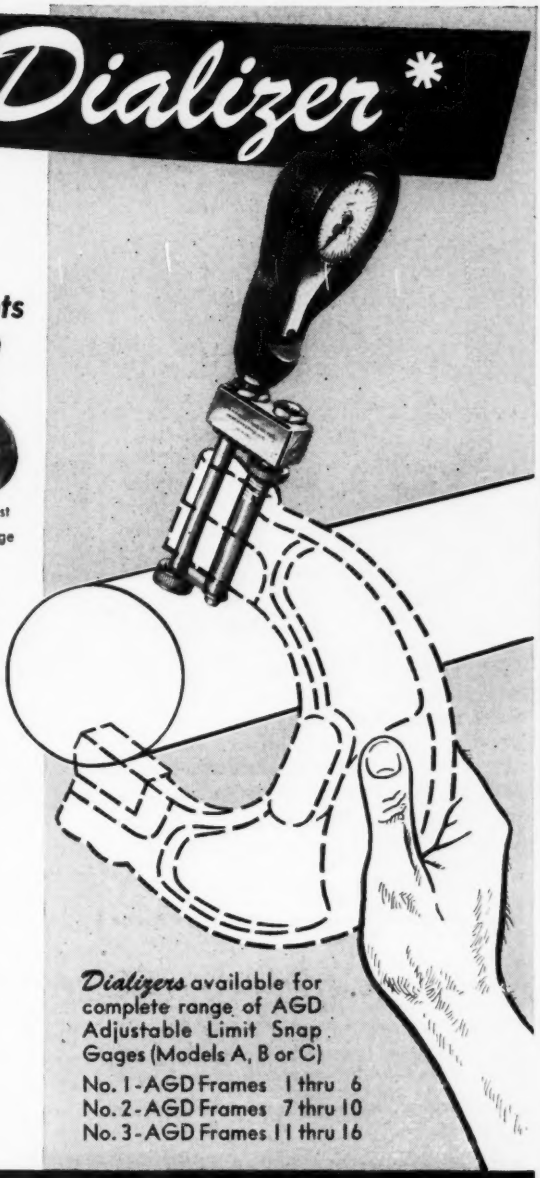

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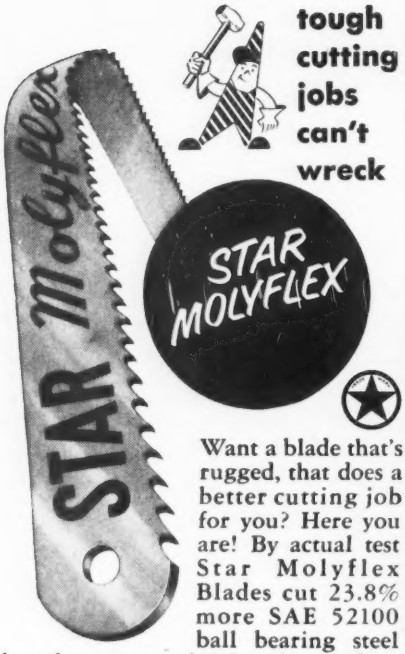

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from the cradle or the reel to the press. There are combination cradle reels and straighteners in use in some places, but in most instances, automatic reels are employed in tandem with a suitable straightening unit.

It is obvious that roller-type units used for straightening strip between the coil and the press feed are subject

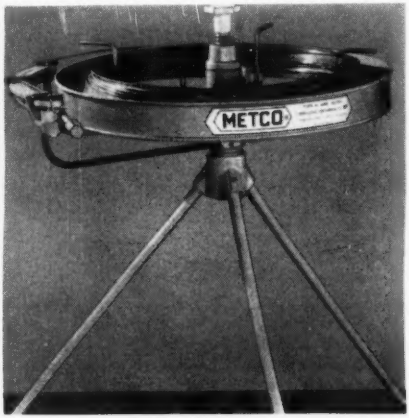
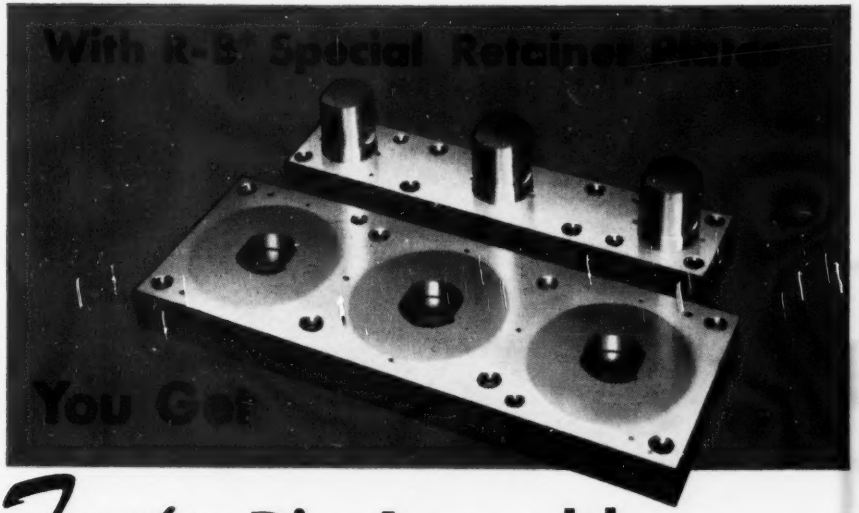


Fig. 9—View of wire straightening unit provided for use in connection with coiled wire fed to a metal-spraying gun. Note how the rollers are arranged to slightly reverse-bend the material as it comes off the coil on its way to the gun. Illustration courtesy Metallizing Engineering Company, Incorporated.

to the same general mechanical principle as roller-type levelers for sheet stock. The thinner the strip being straightened, the smaller in diameter and the closer together must rollers be. Thus, one finds 5, 7 and 9-roller straighteners in use in this way. The five-roller units have one series of two and another series of three rollers, staggered in the approved manner. The seven-roller jobs have one series of three and another series of four, and so on. The thinner the average stock to be fed, the more numerous



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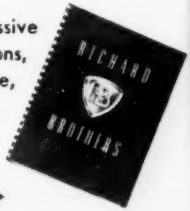
**Richard Brothers*



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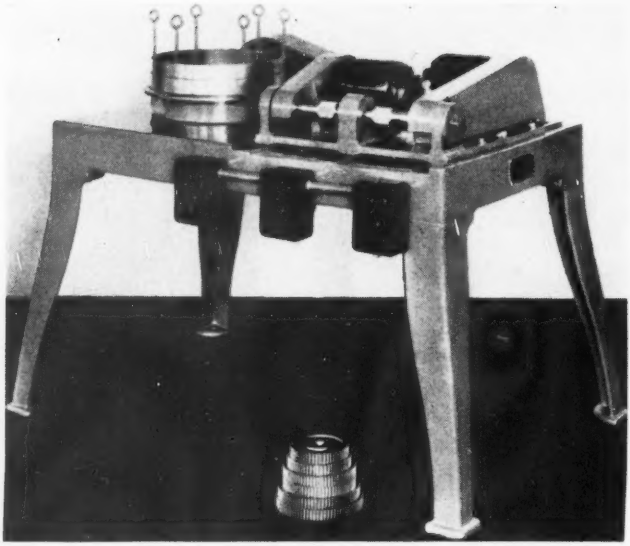

Fig. 10—The type of machine shown here may be used to take wire from a small bundle, or a bundle which has a definite cast in it, and re-straighten the wire, using two rotary flyers running in opposed directions at a speed of 15,000 R.P.M. The straightened wire is then taken up on a larger block. Illustration courtesy Sleeper & Hartley, Incorporated.

the rollers and the more closely they are set together. As a rule, straighteners for coiled strip used in connection with press operations are available from the same manufacturers that make automatic reels and automatic press feeds.

Wire for Metal Spraying

Wire straightening is important in many places and cases. One place worthy of note is in connection with metallizing. Wherever worn parts are being built up by metal spraying, or wherever protective metal coatings are being applied by this process, metal is fed to the metal-spraying gun in the form of wire taken from a coil. When springy wire is fed to a gun of this kind without first removing the coil curvature, an extra amount of frictional drag is imposed on the feeding mechanism of the gun.

While some metal-spraying guns have a sufficiently powerful feed to overcome this additional drag, it still remains true that the excessive strain and friction involved causes unduly worn gears, bearings, nozzles and feed

Pictured: a 24-Spindle Heavy-Duty Drill Head.

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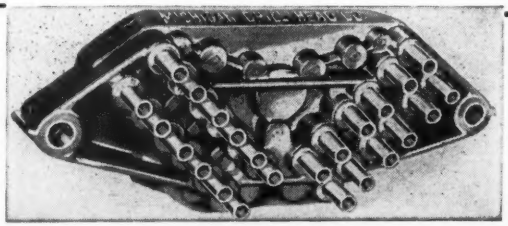

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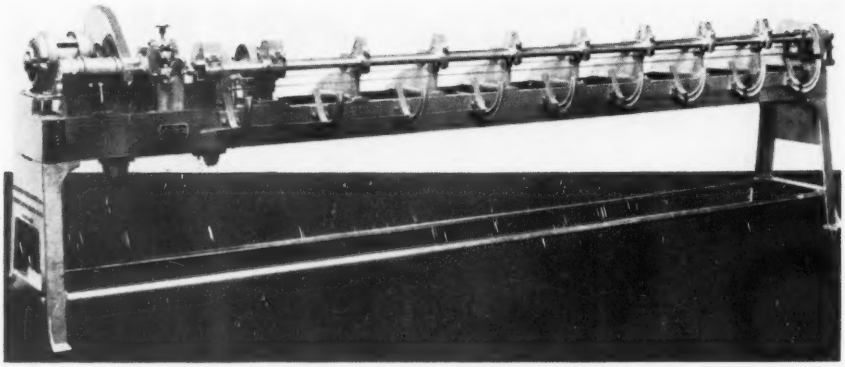

Fig. 11—The machine shown here is equipped with a patented rotating type of cutter bar, with two longitudinal slots in it, 180 degrees apart radially. The straightened wire feeds into one of these slots until the end of it strikes a patented trip mechanism. The trip causes the cutter bar to revolve through 180 degrees, cutting the wire to length as it does so, and bringing the opposite slot into position to receive the oncoming straightened wire for the next cycle. Illustration courtesy Sleeper & Hartley, Incorporated.

rolls. Consequently, straightening units suitable for use in connection with this operation are obtainable from leading manufacturers of metal spraying guns. Another point particularly worthy of note is that pre-straightened wire feeds directly through the **center** of the melting flame. As a result, far better atomization and a far more uniform deposit of metal are obtained. Straightening is performed on such units by pulling the wire through judiciously-arranged pairs of rollers, on its way from the coil to the gun.

One method of wire straightening has to do with passing wire between two series of grooved rollers, which operate to flex the wire in slightly-serpentine fashion, just beyond its elastic limit, after the general manner of a roller sheet leveler. The rolls in this case are grooved, however, to confine the wire sidewise. This leaves something to be desired, because the wire often tends to twist and dodge the straightening action. In some instances, two series of rollers are set to do this in a vertical plane, and after this, two additional series of rollers in the same unit repeat the same process in a hori-

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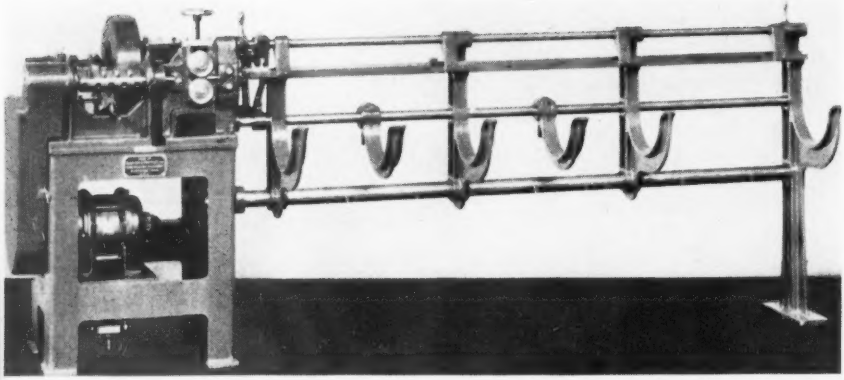

Fig. 12—This illustration shows the conventional clapper-box type of wire-straightening machine. It has a flyer speed of 3500 R.P.M., and a straightening speed of 100 feet of wire per minute. Machines of this type are available to cut lengths of 6, 8, 10, 12, 15, and 20 feet. Illustration courtesy Sleeper & Hartley, Incorporated.

zontal plane. This setup is better, but the wire still has some tendency to dodge.

Special Rotary Layouts

In some instances, a preliminary dual series of rollers operates in this manner, and another dual series of rollers is arranged in a rotary holder, so they not only revolve on their axes to flex the wire slightly in its forward travel, but actually revolve **around** the traveling wire as an axis, in addition. This is a more efficient method, but it often results in some roping or twisting of the wire. Different wire-straightening layouts have been devised by ingenious shop men to meet individual problems, most of which embody some of these principles. Fixtures have been devised which embody dual series of rollers in the general manner mentioned, for instance, and have been held and revolved in the chuck of an engine lathe to form the basis of a wire-straightening or small-tube-straightening layout.

Wire straightening and bundling machines, as they are called, take wire from a small bundle, or a bundle which has a definite cast in it, and re-straighten the wire, using two rotary

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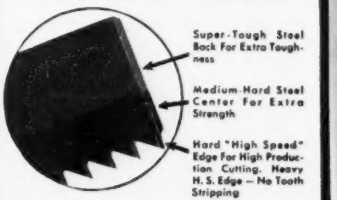
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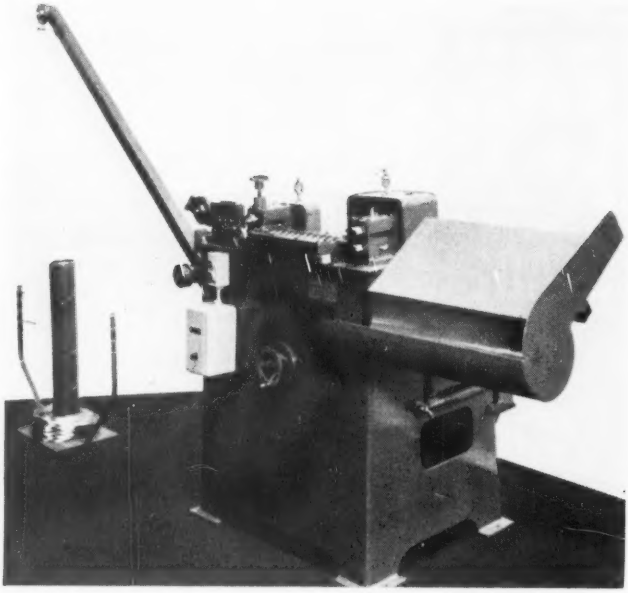

Fig. 13—This illustration shows a new design of high-speed wire straightening machine having a speed of 200 to 500 feet per minute, depending on the stock. Wire is lifted vertically from the coil as shown, passes through a guiding eye and over the sheave at the top of the inclined arm, thence down under the guide sheave at the top of the machine and into the straightening rollers. The feed rolls are interposed between a six-roll vertical straightener and a twenty-roll horizontal straightener. The wire is rough-straightened as the feed rolls pull it through the six-roll vertical unit, and final straightening is accomplished by the twenty-roll horizontal straightener following. Illustration courtesy Sleeper & Hartley, Incorporated.

flyers running in opposed directions, after which the wire is taken up on a larger block. Some very interesting wire straightening and cutting machines feed the wire, as it is straightened, into one of two grooves in a special long cutter bar. The cutter bar has its two grooves 180 degrees apart, and running longitudinally down the bar. When the straightened wire feeding into the groove has fed in to the proper length, the end of it strikes a tripping mechanism which causes the bar to make a half-revolution.

There is a cutter mounted on the infeed end of the cutter bar, which causes the wire to be cut as the bar rotates. As the wire-containing groove rotates to the bottom position, the cut length of wire drops into a trough in a very level, even manner. Meanwhile, the oncoming straightened wire is feeding into the opposite groove in the cutter bar. This type of machine does a very

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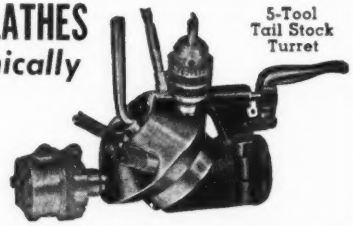

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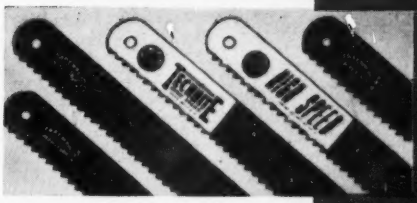

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6. Why does a band saw sometimes cut crooked?

*(Saw Information Quotient)

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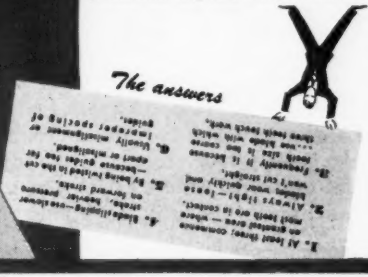

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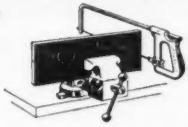

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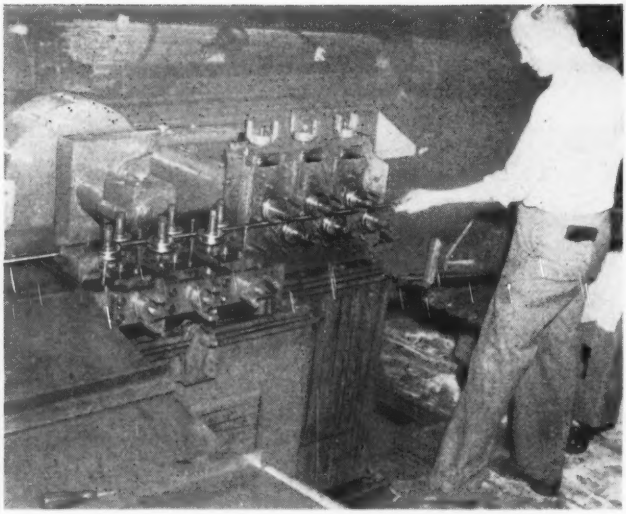


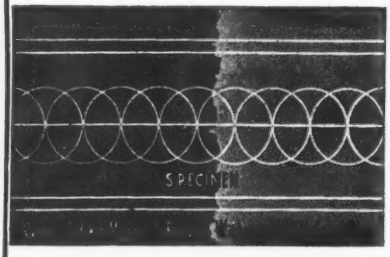
Fig. 14—Machines of the type here shown for straightening small-diameter tubes and rods (though some models will handle tubes up to 2½ in. O.D. maximum) are designed to run at speeds (on the smaller tubes) up to 700 feet per minute. As can be seen, the workpiece first passes through a series of vertical straightening rolls, and then on into and through a series of horizontal straightener rolls. Illustration courtesy Torrington Manufacturing Company.

fine job. Other interesting wire straighteners cannot be described for lack of space.

Tube and rod straighteners are quite often made on the basis of two series of grooved rollers operating in a vertical plane, and two other series of grooved rollers operating directly behind them in a horizontal plane. Some machines of this kind are made with twelve rollers (two dual series of six rollers each) while others are designed with twenty-four rollers (two dual series of twelve rollers each). The machine having the greater number of rollers will naturally do a better job in most cases. For best results in tube straightening on these machines, a separate set of rollers is indicated for each diameter of stock to be straightened.

Crossed-Roll Tube and Bar Straightening

One of the most modern departures in straightening tube and rod stock has to do with use of heavy rollers set at an angle to the axis of the traveling stock, and set at an angle to one another. Much use has been made of this general method in steel mills



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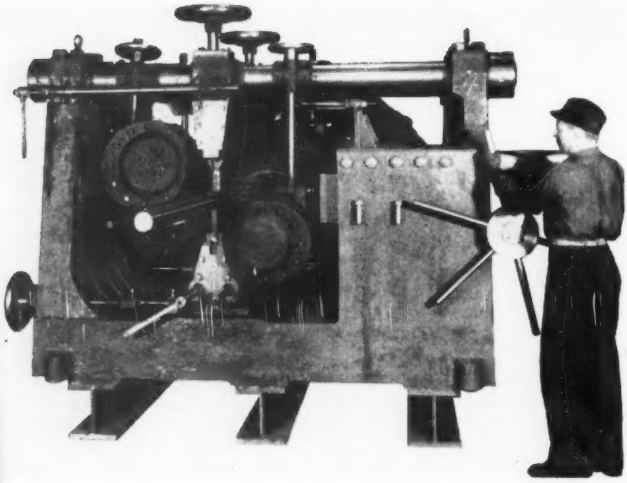

Fig. 15 — This is a view of the end of a crossed-roll heavy-duty straightener, showing a bar of stock between the guides of the machine and engaged by the obliquely-set rollers. The operator is shown at his station. These machines are used in the steel mills, and handle very large-diameter stock as the need appears. Rolls used are hyperboloid in form, and must be maintained by grinding them on a special grinding machine from time to time. Illustration courtesy The Medart Company.

having large volume of such material to straighten. The rolls being set oblique to the axis of the traveling material, and yet exerting pressure upon it, feed the material along longitudinally, and at the same time revolve the tube or bar on its own axis. Under these conditions, the entire surface of

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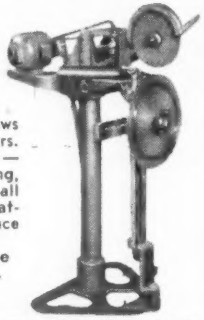

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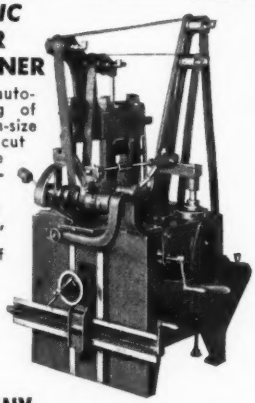

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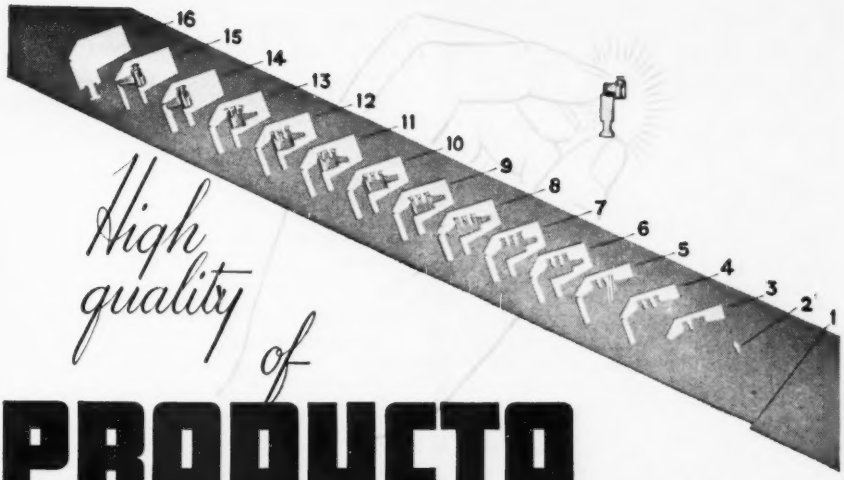

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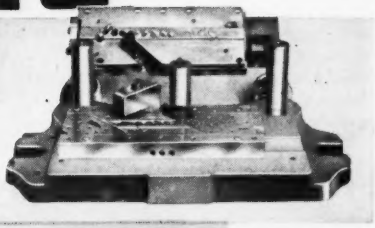

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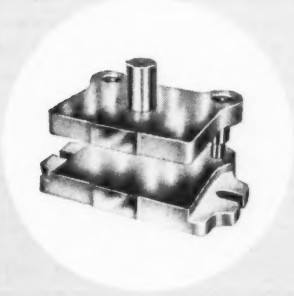

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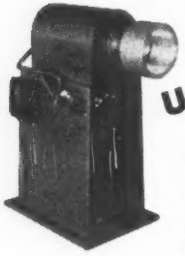

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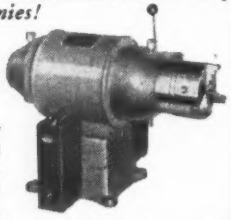

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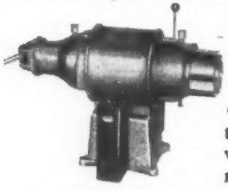

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the tube or bar is worked. Not only does this straighten the material and correct any out-of-roundness that may be present, but there is a natural burnishing action in the process which leaves the material with a better surface. Within limits, actual sizing of stock is a possibility.

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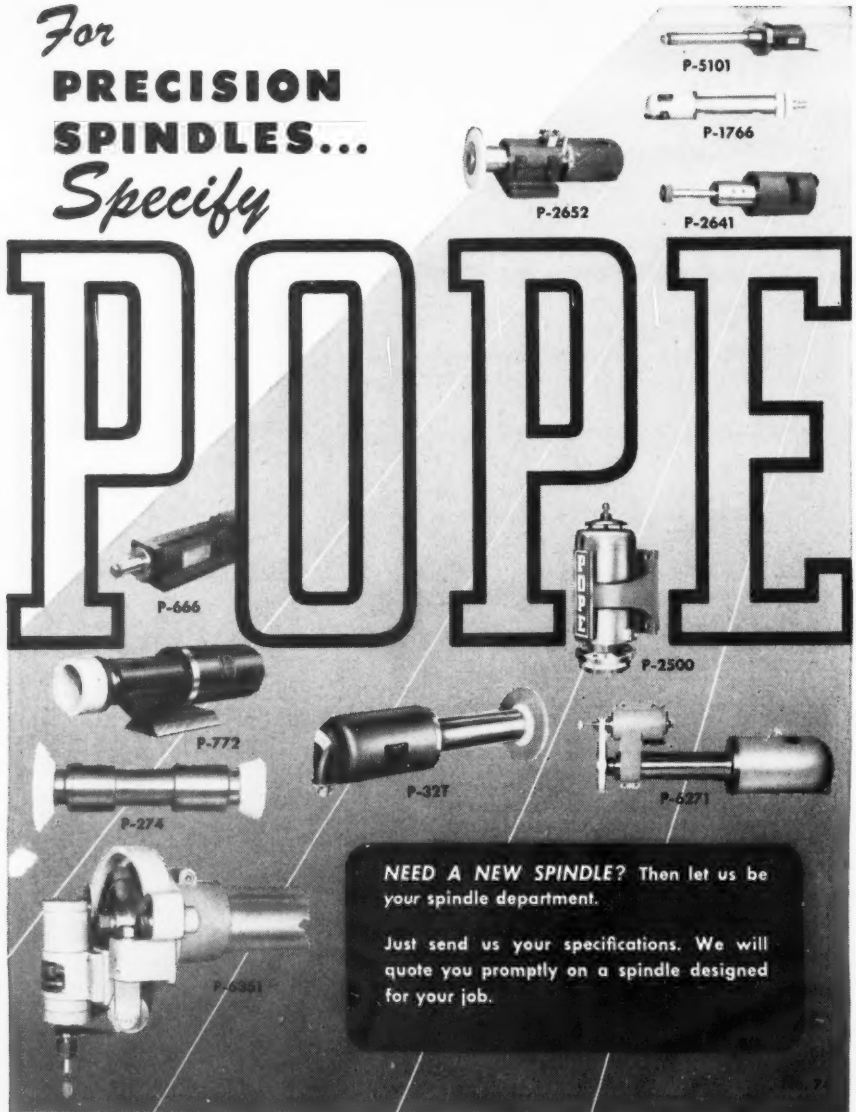

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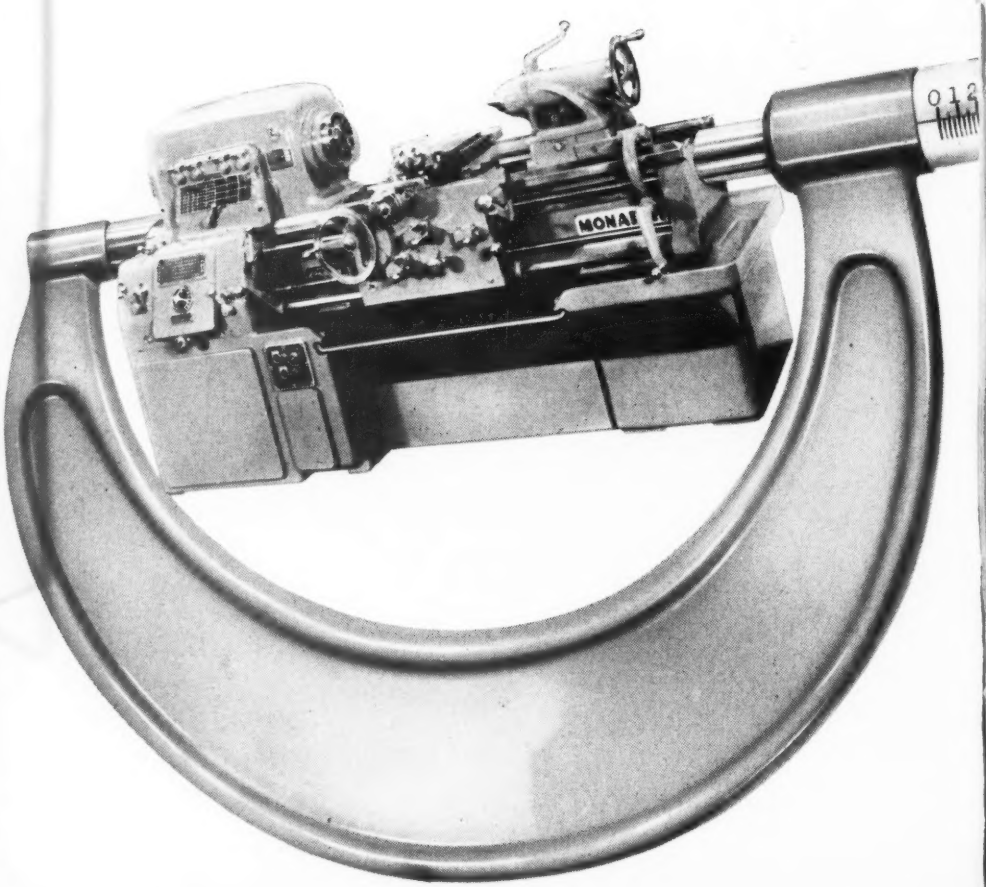

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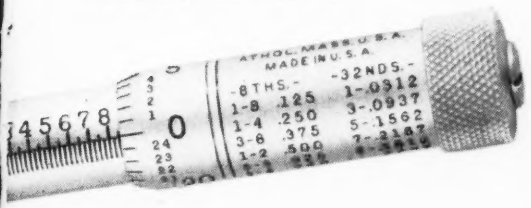

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Ball Extruding Buick Torque Tube Flanges

An interesting forming operation which has enabled Buick to considerably increase flange production.

By Fred W. Vogel

ON Buick cars equipped with the Dynaflow transmission the torque tube is held in position between the transmission unit and the rear axle housing by means of two flanged fittings—one attached to each end of the torque tube. These fittings are of two different sizes, with the larger of the two sizes being used on the end of the torque tube which is attached to the differential case of the rear axle housing. For purposes of describing the operation whereby these flanges are formed in an extrusion operation, the large fitting has been selected but it should be understood that the same principles involved can be adapted to a wide range of flange sizes.

The material for the large size fittings is blanked from $\frac{5}{8}$ in. thick, 1008 rimmed bars, $5\frac{3}{8}$ in. diameter. A $1\frac{3}{4}$ in. hole is pierced through the center of each piece in the blanking operation.

After annealing, the blanks are transferred to the 1000-ton Hamilton press shown in Fig. 1. As shown in the illustration this press is provided at the front with a hand operated workpiece-loading slide which is fastened to the lower die block. A hole is provided in the lower die block, the size of which is determined by the size of the hole which is to be extruded in the

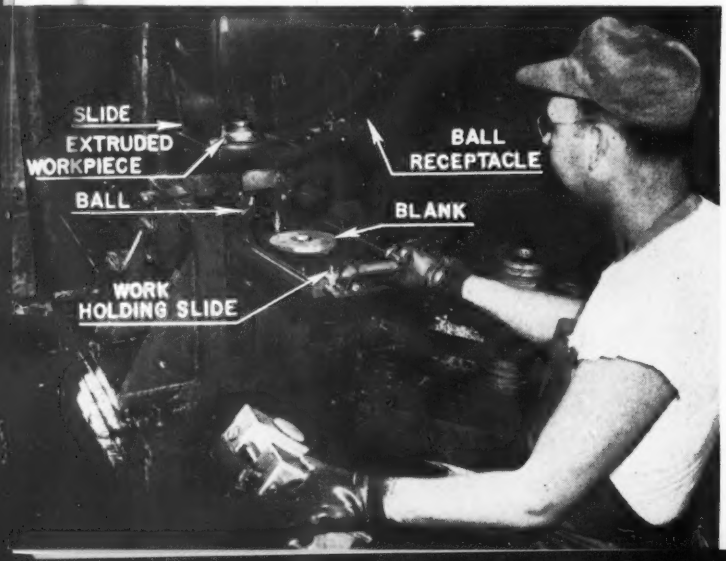

Fig. 1 — Illustration showing setup for ball extruding a neck on Buick torque tube flanges.

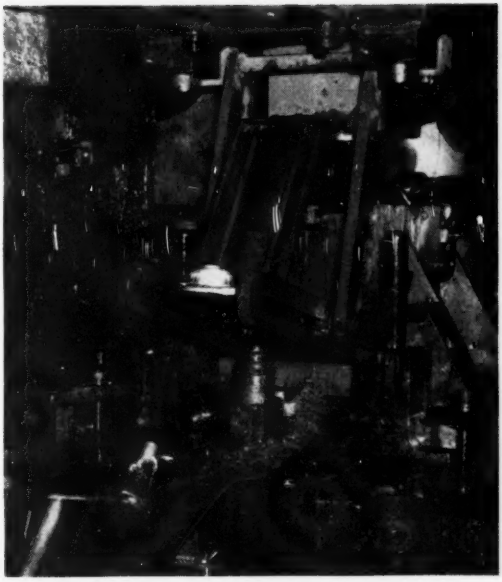

Fig. 2—Rear view of press in which a neck is extruded on Buick torque tube flanges showing the pivot slide.

blank. A stationery post, the upper end of which is cupped to receive a steel ball is also provided in the lower half of the press and designed to pass through the hole in the lower die block when the upper die block, actuated by the ram, descends.

A groove is provided on the surface of the lower die block between the hole in the center and the right side edge in such a manner that a steel ball from the receptacle which is located at the right of the press in close proximity to the die block will roll down to the circular opening in the lower die block and be located in the curvature at the end of the stationary post when the upper die block descends.

Another feature of this operation is the removal of work upon the completion of the extrusion operation. A slide, shown in the rear view Fig. 2 is automatically pivoted upward and beneath the workpiece as the press reaches the full-open position. The extruded neck on the flange strikes a stationary stop located in the upper die block immediately prior to the completion of the full ascent of the upper die block and is kicked out of the die onto the slide. The torque flange rides down the slide into a trough which deflects it into a tote box located at the rear of the press.

Following through the various steps involved in this extrusion operation, the press is in the ready position when a ball is in position on the stationary post. A blank which is placed on the work-loading slide is moved into position above the ball. When the operating button is pushed, the upper die block descends to force the ball through the small diameter opening in the blank, thus forcing the metal outward to form the neck. In the downward action of the upper die block, the ball is forced completely through the now formed neck and is "free" on the top surface of the upper die block. A swivel arm attached to the side of the press is actuated during the last portion of the downward movement of the upper die block to sweep across the block and carry with it the ball for deposition in the ball receptacle.

The balls used in this extruding operation are made of 5200 Ferox High Carbon steel. Those which are used in the extrusion of the 5⅜ in. diameter

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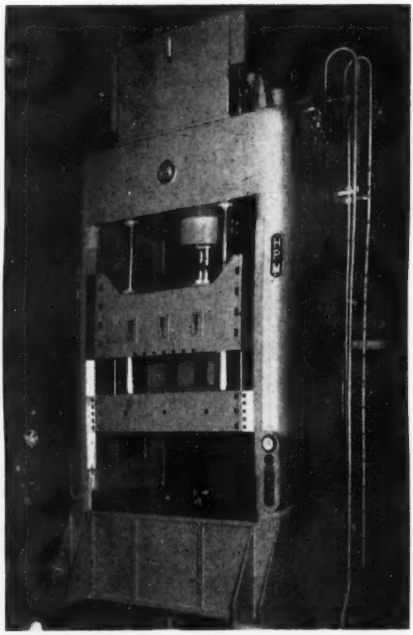
blanks are 3.147 to 3.149 in. in diameter. The production on the extruded flanges by means of the method described averages 375 pieces per hour.

400-Ton Blankholder Press

THE accompanying illustration shows one of two 400-ton blankholder all-hydraulic presses recently completed by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, and installed in the Racine, Wisconsin plant of Massey-Harris for use in the production of drawn sheet metal parts for harvesters, combines, and other farm machinery equipment. The machine features a pressing surface of 96 x 60 inches and is equipped with a 150-ton blankholder and 100-ton die cushion. The presses utilize a 42-inch stroke with a daylight opening of 78 inches, and includes a "Fastraverse" hydraulic power system.



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Designing Drawing And Redrawing Dies

This article explains the operating principle of drawing dies and discusses several interesting designs of such dies.

By C. W. HINMAN
Designing Engineer

THE operating principle of a punch and die unit that is used to draw a shell or cup is believed to be the simplest of all press tool actions. A vertical drawing punch having rounded entering corners is forced into a bell-mouthed die hole, which is larger in diameter than the punch, and pulls a flat sheet metal blank, placed over the hole, down through the die. In doing so, the blank is formed up around the punch and into the shape of a cup whose inside diameter is the same as that of the punch. When the punch ascends, the mouth of the cup contacts the underside of the die block, and the cup is stripped off and falls beneath the press. It is the usual practice to provide a small air vent hole through the length of the punch to break the vacuum and permit easy stripping of the work.

The above described operations are illustrated in Figs. 1, 2, and 3. In Fig. 1, the open clearance **C** extends evenly around the punch and die and is usually of the same width as the work material thickness. There are cases, however, where the clearance is made a few thousandths of an inch **less** than the work thickness for ironing the cup walls thinner, depending upon the ductility of the work material. Otherwise, it is usually the case that when **C** is too great the drawn cup will wrinkle and if it is too small the botton of the cup will be punched out.

A drawing operation, however, is not quite so simple as described above when we are given the job of developing such an operation and making a workable tool drawing for a diemaker to follow. It then becomes one of the most difficult jobs we may have had to handle. The reason for this difficulty when trying to produce a practical tool for a given part is that many problematical details immediately arise for a solution. The most important question is whether the work material is drawable. Is it too thick or thin in relation to the shell diameter? What size and shape of blank contour must be used? What size radii shall we use for the

bellmouthed die hole and drawing punch end? Are the side walls to be ironed thinner? Is the shell to be straight or tapered? Is its cross section round, square, rectangular, hexagonal, or irregular? Is the shell too deep for one-operation draw, or must there be two or more draws? Is it necessary to pinch trim the open end or leave that for a separate operation? Has a metal allowance been made on the blank size for trimming? Is a blankholder necessary, and if so what type? And so the questions go. To answer all of them is but one of the requirements that a drawing die designer must meet.

Pinch Trimming Shells

Some of the above problems can be solved in the following manner. Fig. 4 illustrates how a pinch-off trimming operation can be designed into the die for drawing and trimming in one operation. A hardened and ground steel cutting ring is designed as part of the punch face. The ring is a press fit on the punch and of a diameter the same as that of the drawing die holes. After the shell is drawn and the punch continues to descend, the open end of the shell is forced against the cutting ring. As the punch descent continues, the shell end is forced under the ring which trims its end square with the shell body. When the press ram ascends, the shell is ejected from the die by a spring shedder and off of the punch by a knockout rod. The upper end of the knockout rod contacts a bar across the press head in ascent, thus effecting the ejection of the work.

The pinch trimming of shells does not provide a very neat job. It does not cut a perfectly square edge but it is suitable for most ordinary work. For square edge trimming of die products

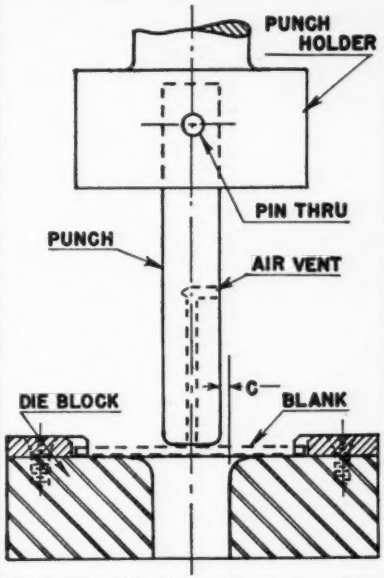

Fig. 1—Metal blank about to be drawn into cup shape.

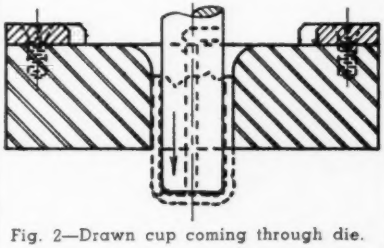
Fig. 2—Drawn cup coming through die.

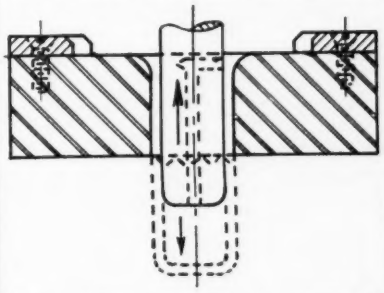
Fig. 3—Drawn cup about to be stripped off punch.

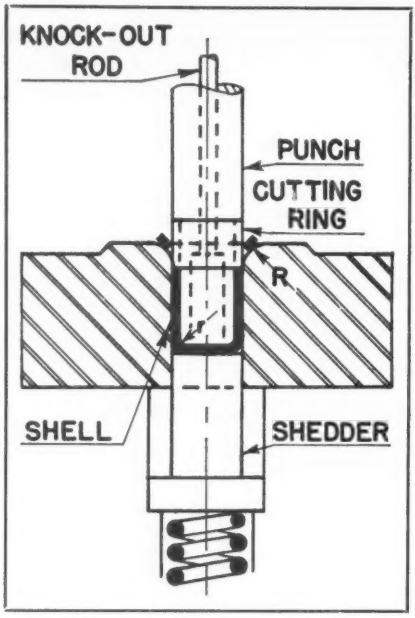

Fig. 4—Setup for drawing and pinch trimming shells in one operation.

a "shimmey die" or a Bliss trimming press should be used. Both of these products will be described later. In all trimming operations, the part sheared off must be added to the blank when computing its size.

What Size of Drawing Radii?

The general rule for size of drawing radii specifies smaller radii for drawing sheet steels and larger ones for drawing nonferrous metals. If the drawing radii are too small, the work will rupture near the face edge of the punch or when entering the die radius. Such ruptures are caused by the excessive friction generated by pulling the metal over an insufficient arc size. On the other hand, if these radii are excessively large, the work material will wrinkle in passing over the entering radius in the die. Obviously, there is an ideal size for the drawing radius that lies between these two extremes.

Although there is a fairly definite relationship between the work thickness and drawing radius **R**, nevertheless the radius should be changed for large blanks and different tempers of metals. For ordinary work when drawing mild steel, the following sizes for **R** have been determined by practice. For 1/64-inch stock, use $\frac{1}{16}$-inch **R**. For $\frac{1}{32}$-inch stock, use $\frac{1}{8}$-inch **R**. For 3/64-inch stock, use $\frac{3}{16}$-inch **R**. For $\frac{1}{16}$-inch stock, use $\frac{1}{4}$-inch **R**. For $\frac{5}{16}$-inch stock, use $\frac{3}{8}$-inch **R**. For $\frac{3}{32}$-inch stock, use $\frac{7}{16}$-inch **R**. For $\frac{1}{8}$-inch stock, use $\frac{9}{16}$-inch **R**.

The above figures refer to radius di-

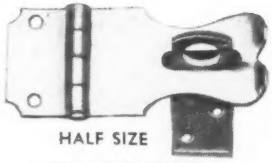

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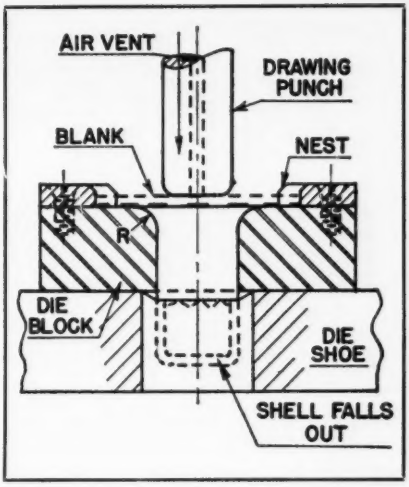
Fig. 5—Cross-sectional view of die for drawing shells without a blank-holder.



mensions **R** in Fig. 4. If **R** exceeds these figures, the blank-holder tension cannot be adjusted to prevent wrinkles in the stock when it is drawn over the die radius. Wrinkles once started cannot be removed; they will show after several anneals and redraws of the shell. If radius **r** on the face edge of the drawing punch is equal to or greater than **R**, it is better. Radius **r** must be as large as practical, especially in shells that are to be redrawn. Much depends on the kind of material being used and most of all on its good deep-drawing qualities. Sheet steel thicknesses above No. 14 U. S. gauge or 0.078 inch can usually be drawn without wrinkling, even without a blank-holder.

The specification for deep-drawing steel is S.A.E. 1010. The first 10 signifies an unalloyed carbon steel of high

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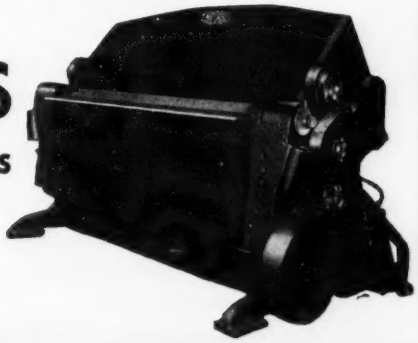

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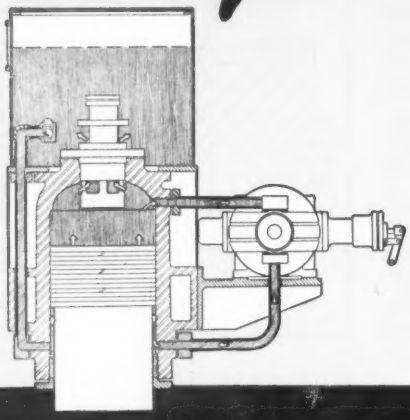

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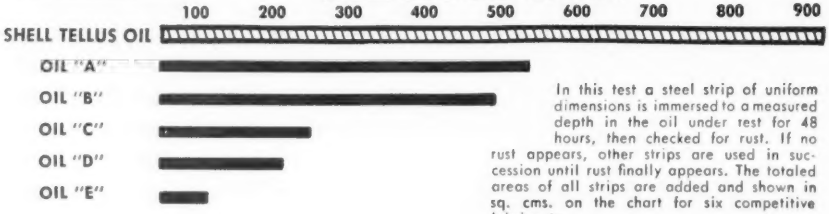

In this test a steel strip of uniform dimensions is immersed to a measured depth in the oil under test for 48 hours, then checked for rust. If no rust appears, other strips are used in succession until rust finally appears. The totaled areas of all strips are added and shown in sq. cms. on the chart for six competitive lubricants.

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ductility, and the second 10 indicates a "10-point" carbon content. In the nonferrous sheet metals, copper draws best; and in the brasses, admiralty metal and cartridge brass. Commercially pure aluminum is considered best for drawing, spinning, and forging. Using this metal in its annealed temper, drawn shells that require several successive operations can be made without the necessity of intermediate annealings. Since alloyed aluminum is less ductile than the pure metal, it requires larger radii in corners and is used for less severe drawing operations than the pure metal.

Drawing Shells without a Blank-Holder

Heavy gauge sheet metals may be drawn successfully without using blank-holder pressure. Thin gauge nonferrous metals are similarly drawn when the finished diameter of shell is small relative to its thickness. Fig. 5 shows the usual design for the die. Radius **R** is made five or six times the blank thickness to provide an easy draw through the die. The shell is stripped from the punch by the sharp corner shown under the die block.

The shell diameter should not exceed 18 to 20 times the blank thickness, otherwise wrinkles may appear in the drawn shell. This fact is well known by manufacturers of cartridge and ammunition shells and for work in which

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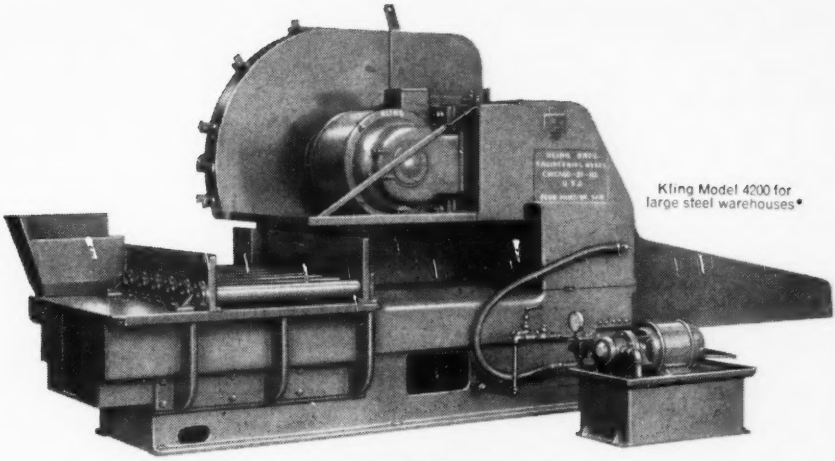

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8" x 8" x ¾" Angle	11 seconds
3" Square	10 seconds
4" Round	15 seconds
6" O.D. Tube, ½" Wall	11 seconds

† Approximate Times

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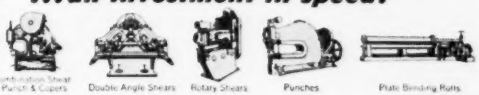

the shell wall must be "ironed" thinner than the bottom in subsequent annealings and redrawings. The principle involved is that the extra thick blank will be stiff enough to resist wrinkling when the punch descent forces the metal into plastic flow around the punch. In other words, the blank is too thick in relation to its shell diameter to form wrinkles.

The next discussion in this series of articles will be a continuation of the present subject.

Manual of Welding Engineering and Design. Third Edition. Published by Eutectic Welding Alloys Corp., Dept. P, 40-40 172nd St., Flushing, N. Y. 50 pages.

According to the publisher, wide acceptance of this welding design manual by various schools and colleges for use as a standard text, as well as by numerous libraries throughout the nation, rapidly exhausted the supply of the first two printings. The latest edition contains a considerable amount of additional information not previously covered. Included are articles on joint preparation by means of electric arc; additional design information; comparative data; new 1951 welding alloy developments; new chemical welding aids developed within the past year; and many items of new procedural information.

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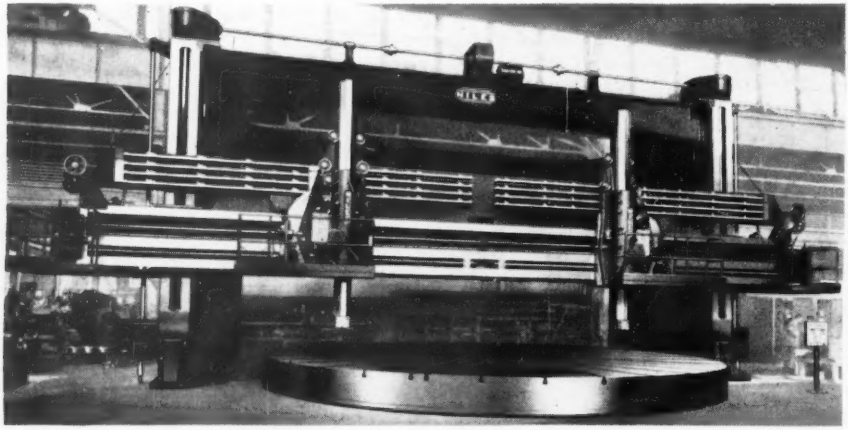

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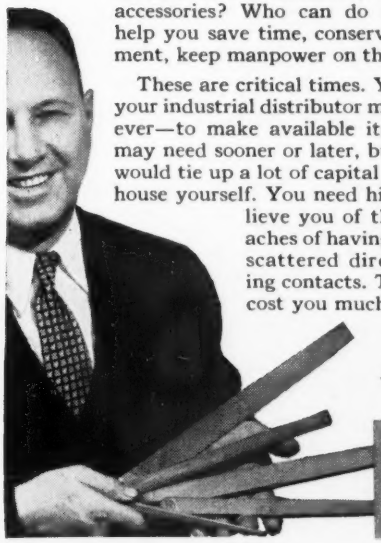

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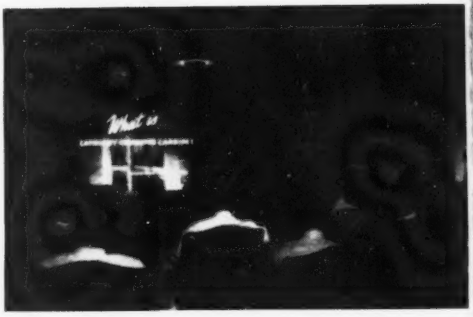

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How to Handle The Man-Power Crisis

A forthright appraisal of the manpower situation with practical suggestions as to what to do about it.

By Charles Furcolowe*

DURING recent months, Selective Service draft calls have been running as high as 50,000 a month and there is every indication that these calls to duty will continue in the months ahead. To metal and machine shop operations, as well as to other segments of American industry, this fore-shadows an early recurrence of the man-power crisis of the war years, when employers in all fields were engaged in a frantic scramble for labor —unskilled, semi-skilled, and skilled. In the past few weeks, in fact, the man-power pinch has already begun to hurt. From here on in, unless immediate remedial measures are adopted, machine shop operations may be severely handicapped.

This growing labor drain is not only the result of draft-call increases; it is also brought on, to a great extent, by the steadily increasing urgency of other companies' help-wanted ads. In such a situation there is no alternative but to place man-power at the head of the list of problems requiring immediate attention. The solution depends upon five basic steps:

1. A job survey must be undertaken to learn the draft status of all workers and the jobs which may be most affected.

2. Jobs which are in danger of being vacated should be analyzed to determine the abilities needed by new workers to fill them properly.

3. A training program must be inaugurated to fill the holes left by departing workers.

4. A comprehensive, well planned and executed replacement drive should be instituted, to recruit new employees.

5. A man-power and equipment utilization program must be launched, in order to make the fullest possible use of present labor and equipment.

Military call-ups will hit virtually every type of machine operation. Die-makers, toolmakers, drill and punch press operators, welders, lathe operators, shipping room and stockroom employees, foremen—no classification is wholly exempt. Some plants, particularly those employing a large number of younger men, will lose more workers than others. Some companies expanded rapidly within the past year, and will lose more of their skilled and semi-skilled employees, who haven't

*Managing Editor, Forbes Magazine, 1944 to 1949.

been on the payroll long enough to be regarded as really "indispensable." Others will find unskilled workers constituting their chief problem—employees with higher skills will in many cases be men with several years' experience behind them, and are likely to be above the draft age. These plants are in a much better situation laborwise.

Obviously, the seriousness of the situation in any particular firm cannot be determined until the first of our five basic steps is taken: a survey of all male workers to learn their age and draft status, their experience, and the existence of any latent abilities. The survey will also serve to reveal which jobs will be most affected by draft calls.

The next step involves job analysis, breaking down and detailing the specific abilities required for the satisfactory performance of each operation, including a report as to whether or not it can be handled by a woman or a handicapped worker, and the amount of time essential to train a replacement.

It is advisable to catalogue workers' hobbies or part-time interests, incidentally. This will bring to light any "hidden" abilities that may prove valuable. A stockroom employee, for instance, may have his own home work-shop, and might be quickly converted to a lathe operator. The fellow who manages the plant ball team may be potential foreman material. And so on.

Job analysis should be followed by a thorough-going training program, to prepare employees to move up into jobs being vacated by their army-bound associates in the shop. The training process should begin with

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those who are to do the training. Supervisors should be sure to explain both the particular operation and also the specific reasons why it is performed in a certain way. This will simplify things if the time comes when the new operator has to explain the job to another replacement.

Training a new man to handle a skilled operation obviously requires a longer period of time. In some cases it may be necessary to resort to outside help. Vocational schools can be invaluable in this connection, and, in some regions, Y.M.C.A. or night school courses may be used. It may also be possible to induce the local manufacturers' association to organize training classes.

It is a good idea, so far as possible, to gear replacement programs around a promotion-from-within theme, taking advantage of incentive such as higher pay and better working conditions, where these exist. Trainees should be selected on the basis of a series of interviews, to determine those best qualified for promotion by temperment, skill, special interests, etc.; to discover which prospects may later be subject to the draft themselves; and to decide who may be entitled to promotion priority because of seniority. The interviews should also be used to elicit information concerning prospective new employees.

For the best results, these sessions should be preceded by conferences with supervisors and foremen, in order

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"the miller that uses its head" is one of industry's genuine bargains!

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to brief them thoroughly on the data desired, interviewing procedure, etc. It is a good idea to revive the war-time technique of using interview check-lists, so that no pertinent questions are left out.

Employees who are selected for training and promotion should be given an opportunity to work at the new job for three or four hours a day. This will enable them to get the feel of their new duties before they are actually "on their own." Furthermore, it permits foremen to observe their progress and proficiency, and gives them the benefit of first-hand instruction by the present job-holder. This will generally prepare them for the job much quicker than if the training process is delayed until a week or two before the old hand departs.

While in-plant promotion is the ideal way to fill employment holes, by itself it will seldom if ever be sufficient to solve the current man-power crisis. Of necessity, outside sources must also be called upon. They are, in fact, the only way in which the problem can be effectively solved at all. There are seven separate outside labor pools: (1) men above the draft age; (2) members of various minority groups; (3) refugee workers; (4) the "handicapped"; (5) women; (6) part-time workers; and (7) former employees.

Men above draft age represent a fairly substantial labor pool in many areas. These over-age workers did yeoman service during the war. In many cases they outproduced their younger co-workers, and usually scored impressive records in safety and attendance. It is a good idea, in some instances, to offer the oldsters such inducements as free transportation, shorter hours, and longer rest periods.

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Card Spiral Pointed Taps are available in carbon steel and high speed steel, cut thread, commercial ground or precision ground. See your nearby Card Distributor.

In Card Spiral Pointed Taps the first few threads are milled at an angle to the axis of the tap and with an extreme rake. The superior cutting action of this feature produces a long, curling chip, which is forced ahead of the tap, eliminating chip clogging. This enables the tap to be made with a shallow, straight fluting that greatly increases tap strength and reduces breakage to a minimum.

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Make it a Rule to Call Motor Tool

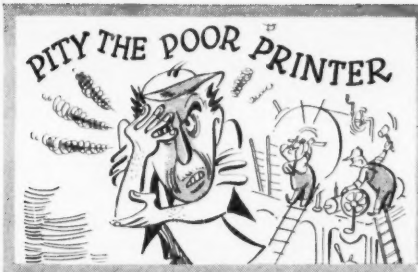
Incidentally, don't wait for them to apply for jobs. Let them know they're wanted before someone else does.

The second outside labor pool—members of minority groups—are an excellent source of new workers when manpower is scarce. Since as a general rule they tend to be the first groups laid off when business slumps—as thousands of Negro workers can testify from experience—when jobs start becoming plentiful again they tend to be a fairly numerous group. Many of these workers are already at work; others are being hired daily.

Refugee workers are a third source of recruits. This group, too, is already performing capably in many plants. Generally speaking, they may be depended upon to do careful, workmanlike jobs. They are usually somewhat above the average in intelligence and education, and, because they are likely to have difficulty finding employment during periods of depression, are eager to demonstrate their capabilities when given the chance.

The experience of many companies during the war proved once and for all that the so-called "handicapped" worker can more than hold his own with his abler colleagues on any job in which his particular disability is not a complete bar. Many firms have testified to the fact that the handicapped have often outperformed normal workers. In general, too, they tend to have better safety records than employees with no physical disabilities. Their rate of absenteeism is also apt to be lower.

Women, our fifth labor replacement pool, offered permanent proof during the war that they could replace men in the shop as well as the office. They will again have to be called upon in the present emergency. Women between



TEN "BARGAIN PRICE" GEARS SAVED HIM $10.50 — AND COST HIM $96.00

It was a printing press drive. The five pairs of gears soon were out and were replaced by BOSTON Spur Gears cut 20° Pressure Angle*

Cost of pulling down press and replacing gears (two men, 4 hrs. @ $2.00 per hr.)	$16.00
Down Time loss (profit and overhead) 10 reams per hr. @ $2.00 per ream	$80.00
TOTAL	$96.00

FOUR "BARGAIN PRICE" GEARS SAVED HIM $2.40 — AND COST HIM $178.00

Four inferior gears driving a packaging machine had to be replaced by BOSTON Gears.

Cost of repairing machine (one man, 8 hrs. @ $2.25 per hr.)	$18.00
Down Time loss (profit and overhead) — 8 hours production, 2000 units per hr. @ $0.01 apiece	$160.00
TOTAL	$178.00

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Specify Boston 20° Pressure Angle Gears instead of the ordinary 14½° P.A. gears of identical horsepower rating and save:

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Ask your nearby Boston Gear Distributor for Boston 20° Pressure Angle Gears.

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the ages of twenty-five and fifty-five are the most numerous of all the country's non-working groups. Most of them are married; many have young children. The married women will in many cases be available for fulltime employment; the mothers may be called upon for part-time tasks.

As to the capabilities of this female work contingent, an executive of a large precision tool firm has summed it up this way: "Women can do anything —just keep their hair out of the machines." Backing up his statement is their war-time record, when they doubled for their husbands and brothers as lathe and drill press operators, welders, riveters, laborers, etc.

Part-time workers, too, may make excellent replacements as the manpower squeeze grows tighter. It may sometimes be necessary to establish special shifts in order to make maximum use of this group, as was frequently done during the war years.

Most part-timers will either be women or students. In the case of the latter, schedules must be arranged so that their day does not start any earlier than 1:00 P.M. It is also advisable to discuss the entire situation with the local high school officials. Give them full details about wages, working hours and conditions, and so on, and they will be glad to cooperate in the preparation of a mutually satisfactory schedule.

The final source of replacements—former employees—may be more productive of results than might

HOLES HOLES

and more HOLES 1500 of them

To be sure, this may be an unusual job. However, it proved the flexibility and practicability of the Bullard Spacer.

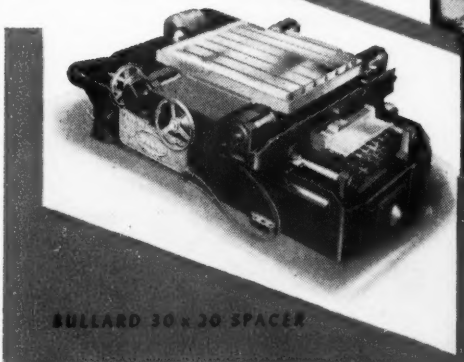
It required several combination of settings between the work location on the table and the drill saddle and arm.

However, the actual set-up and machining time figured 5-½ hours for the Spacer instead of 11-½ by the best previous method.

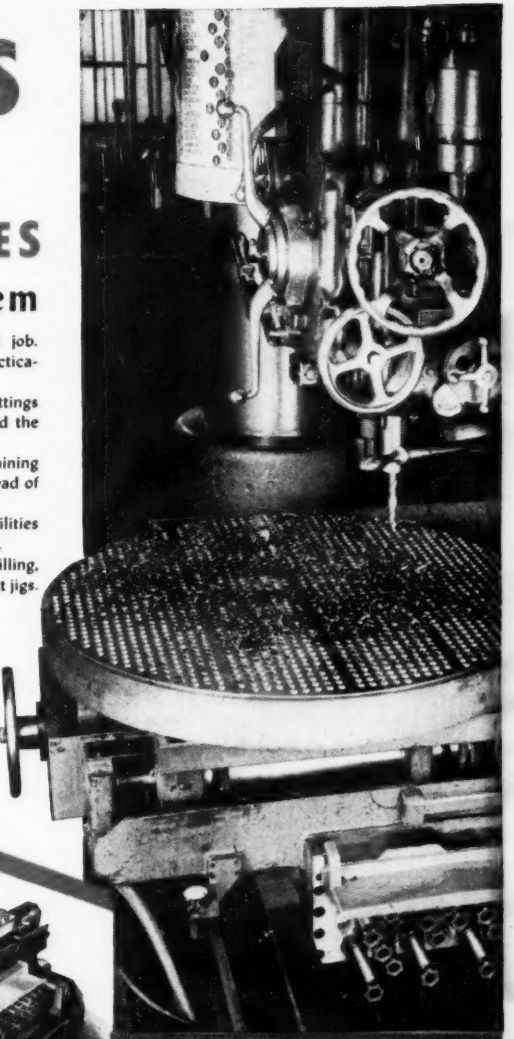
This case study illustrates the possibilities and wide application of the Bullard Spacer.

Here is a machine for spotting, drilling, counterboring, reaming, or tapping—without jigs.

Ask Bullard Engineers how your Jig Costs and problems can be reduced.



BULLARD 30 x 30 SPACER



THE BULLARD COMPANY
BRIDGEPORT 2, CONN.

be imagined. The first step here would be to check over the war-time payroll list. This should be followed by a letter to all ex-employees, informing them of the fact that job openings are forthcoming and that applications are again wanted.

One of the most important aspects of a labor replacement program, of course, is a publicity and advertising campaign. Workers may be available, but unless they know that job openings are developing they are not going to come pounding at employment office doors. The following six methods will get results:

1. **Help-Wanted Ads in Local Papers.** The classified columns are a "must" for any recruiting campaign. To obtain top results, however, they must contain more than a mere "men wanted" or "machinists wanted" or "press operators wanted" notice. Publish as many pertinent details as possible about the jobs. List specific requirements, wage rates, overtime, work conditions, insurance, hospitalization and other benefits available, and so on.

2. **Out-of-Town Papers.** The Help-Wanted columns of out-of-town papers will often net more applicants than those in local publications. Some sections of the country still have surplus man-power. Ads in these areas will frequently pay off. One New York firm has found it practical to employ a full-time traveling personnel man, who tours the country to interview applicants who respond to ads in various cities.

3. **Radio Advertising.** One-minute spot announcements over local stations can often be more effective than newspaper advertising. The Army and Navy have used this method successfully, incidentally. Just be sure to time appeals so that they reach housewives in the morning and the men in the evening.

4. **Written Publicity.** Published articles about a plant always arouse interest in it. Stories can run the gamut from newspaper pieces about the company history and achievements to magazine articles about interesting executives, new techniques, machining innovations, etc. Anything that makes the plant better known stimulates interest in it as a place to work.

5. **Word-of-Mouth Publicity.** It is hard to beat person-to-person communication as an advertising technique. Spread the word about job opportunities in local churches, lodges, and clubs. It is also good practice to notify the proprietors or managers of various local business establishments,

WESTLEN Adjustable Self Centering REELS

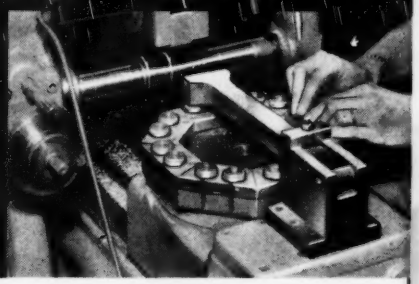
For feeding strip and wire coil stock to presses. Coil capacity 300 to 500 lbs. Outside ring dia., 28" to 36". Height of reel, 36". Wheel automatically adjusts parts to suit inside diameter of coils from 11" to 20". Arm allows for quick conversion to horizontal or vertical position and adjusts height of reel.

Write for prices and literature.

The RULETA Co.
27 WARREN ST. NEW YORK 7,

Want More Milling Production?

...Simply Add a SUNDSTRAND Automatic Index Base



Many methods engineers have found the Sundstrand Automatic Index Base a simple solution to increasing production. Its application to milling, boring and drilling jobs also improves accuracy and invariably makes it easier for the operator to produce more pieces per hour. Increased production and improved accuracy are both obtained while eliminating operator fatigue.

Accurate Spacing, Powerful Clamping Insures Accuracy

Unlike many conventional index bases, the Sundstrand Automatic Index Base is designed so there is no strain against the index plunger during the cut. The base is locked securely during cut by powerful clamping action applied radially. Strain against the index plunger and master plate is relieved when the base is in locked position so that accuracy of index is not affected by heavy cuts.

800 Pieces Milled Per Hr.

Here's just one of the many typical ,profitable installations of Sundstrand Automatic Index Bases. As illustrated above, this 8 station index base eliminates "down-time" on a slotting operation. Operator merely loads and unloads part during automatic cycling of machine. At each station two parts are held by an automatically operated clamp. Higher production figures like this are commonplace with the Sundstrand Automatic Index Base. It will work equally well for you.

Sundstrand Automatic Index Base

Clamping for the cut, unclamping after the cut, indexing to each station, and stop at the completion of the desired number of indexes is all automatically controlled by limit switches. These are operated by a moving member of the machine such as a milling machine table. Thus, the operator's duties are greatly simplified permitting him to run several machines depending on operation and number of indexes.

Get Complete Data

FREE

Ask for bulletin 509.

SUNDSTRAND

SUNDSTRAND MACHINE TOOL CO.

2539 ELEVENTH ST. ROCKFORD, ILLINOIS, U.S.A.

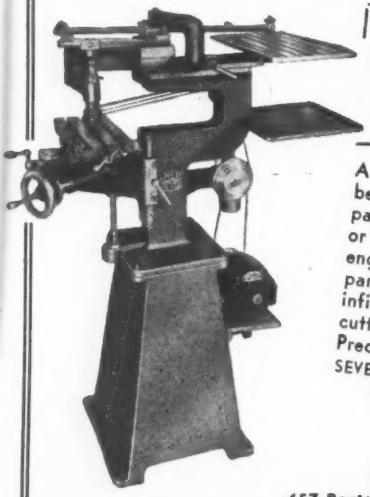
the heavy-traffic ones especially: diners, filling stations, theaters, etc. And don't overlook the local trade schools.

6. **Present Employees.** A plant's own workers are sometimes the best of all recruiting agents. Simply let them know about forthcoming job opportunities and they will usually be eager to tell their friends and families. And because as a rule they live in various areas of a city, the news will spread quickly to all parts of the community, in every neighborhood. It is a good idea, by the way, to revive the wartime practice of offering prizes or bonuses to employees who produce the largest number of job applicants. It will pay dividends.

Regardless of how successful a recruiting campaign may be, it should be supplemented with a program designed to insure the maximum use of present man-power—and, of course, of present equipment. To keep absenteeism and turnover low, and to maintain morale at high levels, labor problems must be met and solved **before** they develop into full-scale grievances. The way to do it is through a thorough attitude survey, which for best results should be taken by a competent labor relations firm. Such a survey will do five things: (1) reveal various dissatisfactions which may exist, (2) discover the causes of the discontent, (3) show up weaknesses in the communications system, that failed to reveal dissatisfactions sooner, (4) highlight possible weak spots in various plant policies, (5) indicate ways and means of preventing similar difficulties in the future.

As a rule, employee attitude surveys reveal four principal generators of employee grievances, as follows:

1. **Operating Factors.** Well organ-



NEW MODEL 2D-4
PANTO-ENGRAVER

A precision two-dimensional engraving machine, bench or floor model for large metal or plastic panels, signs and name plates; steel stamps and dies or any product requiring production or precision engraving. Will engrave to center of 30 inch wide panels. Pantograph reductions from 1:1 ratio to infinity. Collet capacity 1/10" to 1/4" diameter. Six cutter spindle speeds from 5,000 to 14,000 R.P.M. Precision ball bearings throughout.

SEVERAL OTHER MODELS AVAILABLE FOR ENGRAVING, ACID ETCHING AND ELECTRICAL MARKING.

Write for Illustrated Literature Today

H. P. PREIS ENGRAVING MACHINE CO.

657 Route 29 Hillside 5, N. J.

MARKING PANTO EQUIPMENT

NEED THIS MONDAY MORNING?

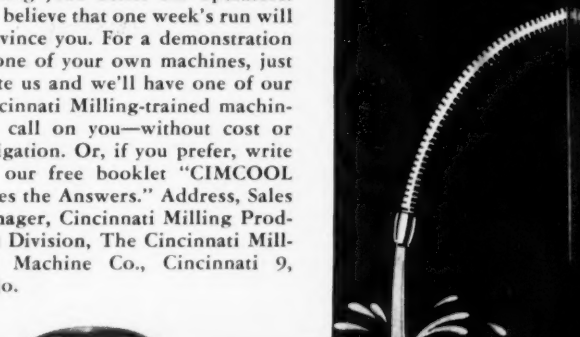
SWITCH TO CIMCOOL!

There's no Monday morning odor when Cimcool° is on the job. For this revolutionary cutting fluid virtually eliminates rancidity and foul odors —*even in the hottest weather!*

Cimcool is superior to old-fashioned coolants because it's a *chemical emulsion.* Can't burn. Can't smoke. Has no objectionable odor of its own. Doesn't soil hands or clothes and contains no skin irritants. Leaves no hazardous slippery film on the hands, machine, work or floor. And Cimcool cools so fast that tools and chips actually stay cool to the touch.

And *Cimcool does a better job* while making jobs better for operators. We believe that one week's run will convince you. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.



A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

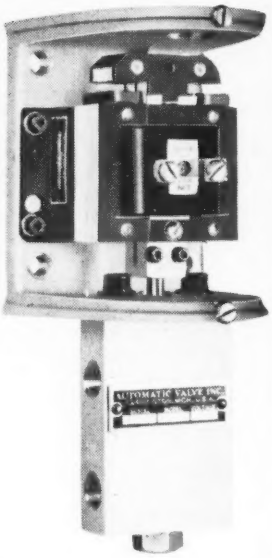
ized and efficiently run operations are essential if employees are to feel satisfied in their jobs. In machine shop work this means good scheduling; efficient, up-to-date machines and other equipment; adequate storage facilities; ample stocks of tools, especially in tool and die departments; and enough help (plus a low absentee rate).

2. **Supervisory Inefficiencies.** For peak morale, foremen and supervisors should be trained in the proper handling of men. Too many of them are selected solely on the basis of their ability to "get the work out." The result is such employee complaints as: "Foremen have too much to do to supervise properly"; "they don't do anything to make you want to take an interest in your job"; "they can't be bothered answering questions or listening to problems"; "they're always playing favorites"; "they don't have enough authority"; "they don't know any more about the bonus system than we do." Employee "gripes" of this sort spell trouble — and a stepped-up labor turnover rate.

3. **Policy Dissatisfactions.** Poor plant policy can produce a host of grievances. There are two essentials here: first, be sure policies are fair, and second, be sure that employees understand them. Workers in one recent survey, for example, complained because the hourly rates paid for different jobs were inequitable, the incentive system

AV PILOT VALVES

For Operating Small Cylinders & Master Valves



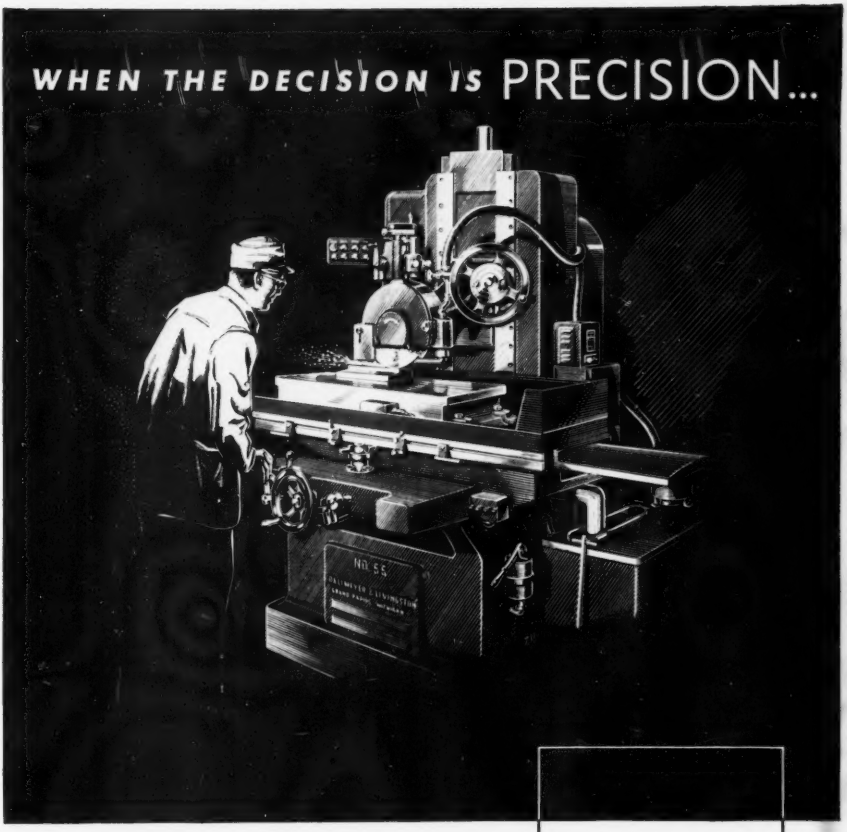
Compact, sturdy construction precision engineered for high speed and long uninterupted heavy duty operation, Automatic valves have small, well protected solenoids for operating small cylinders and air and hydraulic master valves.

Reasonably priced—Attractive quantity and O.E.M. discounts. Write for bulletin.

AUTOMATIC VALVE CO.
37419 GRAND RIVER AVE., FARMINGTON, MICH.

PIONEERS and SPECIALISTS in PILOT OPERATED SOLENOID CONTROLLED VALVES

WHEN THE DECISION IS PRECISION...



Where extreme tolerances are not required, the choice of any particular grinding machine may not be too important. But, where absolute precision is demanded, the choice is usually *Grand Rapids.*

Defense orders make it impossible to fill orders as quickly as we desire—but we know our customers can appreciate the reasons for delay. As always we'll do our best to serve you.

GALLMEYER & LIVINGSTON CO.
308 Straight Ave., Grand Rapids, Mich.

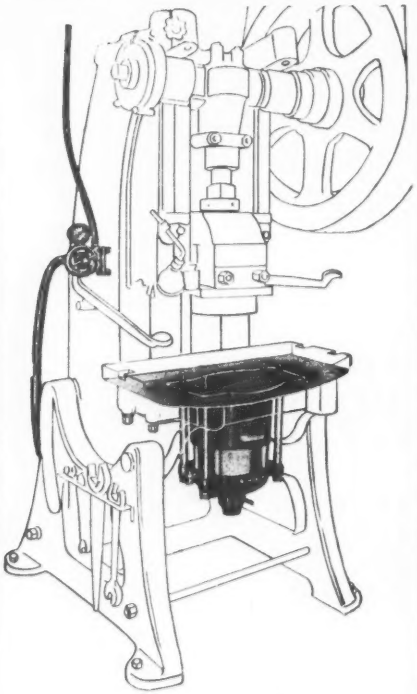
Grand Rapids Grinders
—World's finest

GALLMEYER & LIVINGSTON

DIE CUSHIONS

for all

PUNCH PRESS REQUIREMENTS



Adaptable to all deep drawing operations and all pressure pad control on forming dies.

Write for catalog No. 100

DAYTON ROGERS

Manufacturing Company

Minneapolis 7, Minnesota

was considered unfair, there was no overtime paid for hours in excess of eight a day unless the weeks total topped forty hours, and because there was discrimination in the assigning of overtime.

In addition to avoiding such policy pitfalls as the above, care should be taken to see that employees know the reasons for particular policies. It is also good practice to inform them about plans in the works, plant problems, and other pertinent company developments.

4. **Communications.** One labor relations authority estimates that 25 to 50 per cent of all employee dissatisfactions are a direct result of flaws in the communications system. Remember that "an informed employee is a contented employee," and a contented employee isn't liable to be reading the want ads every day. When a general atmosphere of "we never know what's going on around here" pervades a plant, labor turnover invariably climbs to new heights. During periods of labor scarcity this can hamstring a plant. Avoid it by keeping employees posted about developments which affect them, by means of bulletin boards (kept up to date), plant papers, occasional talks by executives, periodic memos to foremen, and so on.

Employees want to know the truth about plant rumors; they want to know about their chances for advancement or higher pay; they want to know why various policies have been instituted or changed; and so on. These things can only be achieved by a good communications system. It is a major key to stability among employees, and when man-power is scarce nothing is more important than a stable workforce.

Production Pointers from GISHOLT

TIME SAVING IDEAS

Why Gisholt's Recommendations are Unbiased—In helping you solve your turning problems, Gisholt engineers have no reason to favor one type of machine over another except on the basis of its ability to best serve your needs. For Gisholt manufactures both manually operated turret lathes and automatic lathes.

BOTH MACHINING AND SUPERFINISHING DONE ON ONE MACHINE

Production Stepped Up, Manpower Saved by Double Feature Machine

Here's the *first* time machining and Superfinishing have ever been combined in one chucking! There will be more of this sort of thing.

The two separate functions on cast-iron truck flywheels are combined on this standard Gisholt No. 12 Hydraulic Automatic Lathe with simple Superfinishing attachments.

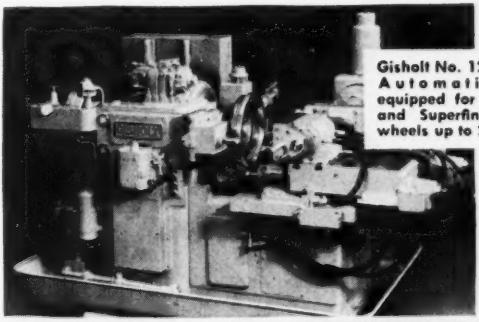
Here's a really smart tooling arrangement. The machining cycle is worked out so that the main front slide, as it moves to bore the rim, engages a plunger which actuates the headstock auxiliary slide to finish turn the back hub. The front slide then completes facing the clutch surface.

SUPERFINISHING TAKES OVER

As the cutting tools clear the work, two rear slides with Superfinishing attachments (instead of tools) move into position. A rear auxiliary slide mounted on the headstock carries a No. 1 size attachment for finishing the oil seal bearing on the hub. Superfinishing brings the surface from 150-200 micro-inches RMS down to 3 to 6 micro-inches RMS. Grinding is eliminated and this ultra-fine finish leaves no roughness to abrade the packing and cause future oil leakage.

The main rear slide carries a No. 4 size attachment for Superfinishing the clutch surface which measures 150-200 micro-inches RMS after facing. This surface *must* be flat and smooth for good friction area. To protect against excessive wear and tear of the clutch plate, the marks left by turning are entirely removed so there is true "base metal" and the desired surface finish of 20-30 micro-inches RMS is readily obtained. Total time for all operations is only 5.8 minutes, floor to floor. Of this, Superfinishing requires less than one minute.

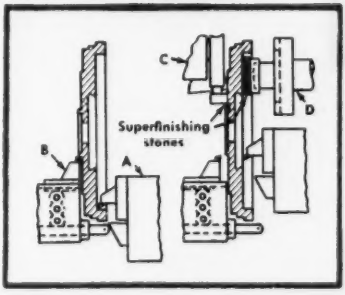
Summing it up—this one machine in one chucking, and in a continuous automatic cycle: (1) finish bores the flywheel rim; (2) finish faces clutch surface; (3) finish turns the hub and oil seal; (4) Superfinishes the oil seal; and (5) Superfinishes the clutch face.



Gisholt No. 12 Hydraulic Automatic Lathe equipped for machining and Superfinishing flywheels up to 24".

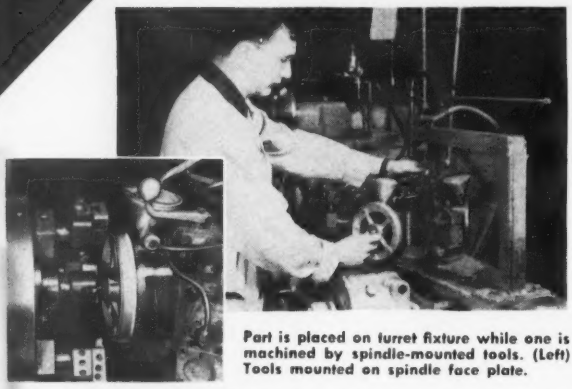
MACHINING—As front slide (A) feeds in to bore rim, plunger starts slide (B) that finish turns back hub. When front slide starts feeding inward, plunger returns to original position.

SUPERFINISHING—Rear slide (C) has No. 1 Superfinishing attachment for finishing oil seal bearing. Slide (D) with No. 4 attachment finishes clutch plate face. Abrasive stones scrub away the amorphous metal to produce desired finish.

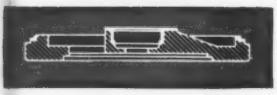


FOR MORE PRODUCTION FROM

TURN-ABOUT IDEA DOUBLES PRODUCTION



Part is placed on turret fixture while one is machined by spindle-mounted tools. (Left) Tools mounted on spindle face plate.



Heavy lines show surfaces machined in this novel reverse setup.

Look at this tool setup again. That's right, they've reversed the usual procedure in machining aluminum die cast end frames. Tools are *on the spindle*—work is on the turret faces. Credit for the idea and tooling goes to Mr. H. L. Stephenson of the A. O. Smith Corporation (formerly Whirl-A-Way Motors, Inc.), Tipp City, Ohio.

The job is on a Gisholt No. 4 Ram Type Turret Lathe. Adjustable tools are mounted on a face plate on the spindle. Carrying out the reverse play—three holding fixtures for the workpiece are mounted on alternate faces of the turret. The parts are held rigidly by an air-operated bar and a C-washer.

Think of the advantages! The spindle runs continuously with no lost time for starting, stopping, chucking and unloading.

Production goes as high as 1000 per 8-hour shift—a real tribute to smart planning and a fast turret lathe. Moreover, tolerance in the bore is consistently held to ± 0.0001.

With the parts on the turret and tools on the spindle, machining is continuous except for the brief time needed for indexing new part into position.

A GOOD SETUP FOR THIS DIFFICULT CYLINDER LINER JOB

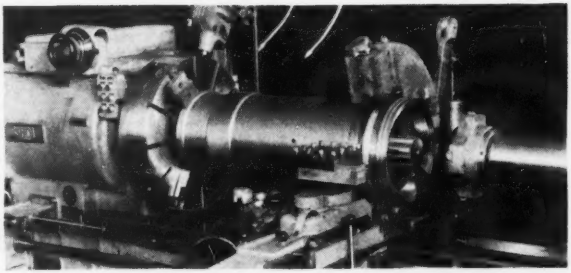
Some Special Stunts Simplify Machining Problems on Big Parts

This smart setup on a standard Gisholt 5L Saddle Type Turret Lathe licked a lot of problems for a manufacturer of diesel engines.

A 15" 3-jaw scroll chuck is mounted on one face of the hexagon turret to center and support the end of the big, heavy liners during preliminary machining of the diameter which later takes the steadyrest. Adjacent surfaces, best handled before the steadyrest is applied, are also machined then.

Novel Boring Bar Arrangement

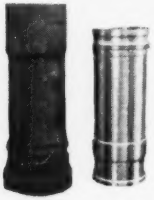
Note the arrangement for piloting the multiple cutter boring head. The big pilot bar is hydraulically advanced, thereby providing excellent support for the boring head. Also, because it can be retracted within the spindle, it does not interfere with loading and unloading—making it possible to do this job on a machine of standard bed length.



Arrow shows pilot bar which not only supports boring head but retracts back into spindle for loading and unloading.

The steadyrest is supported on the rear way and carrier of the bed—leaving the front way unobstructed so the square turret can work anywhere. Thus, other machining can be done while the long bore is being finished.

Using a chuck on 1 face of the hexagon turret . . . retractable pilot bar . . . and steadyrest help permit other machining operations to be done while boring—all help make this job simpler, faster.



Liners—rough and after machining on 5L Saddle Type Turret Lathe.

GISHOLT

TIME SAVING IDEAS

GISHOLT

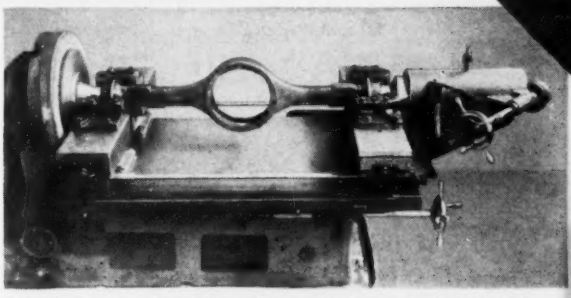
BOTH ENDS OF AXLE HOUSINGS FINISHED AT SAME TIME ON SIMPLIMATIC

A Simple Way to Big Savings

Both ends of these truck axle housings are rough and finish turned at the same time by a Simplimatic Automatic Lathe. The machine is standard except for the tailstock and a longer table. All tools are standard.

Driving is done by an internal chucking device, having 3 separate eccentric rollers, each mating with a common gear so the three operate simultaneously to centralize the piece. There's an expanding chuck in the tailstock for centering and carrying the outer end of the housing.

Both flanges are faced on both sides and turned, and the housing ends are faced and formed on both sides of the lugs. Four slides with four groups of tools all working together take care of rough and finish machining.



Simplimatic setup for machining both ends of axle housing at one time.

The Simplimatic proves its adaptability on this job by rough and finish turning both ends of part at same time.

AUTOMATIC RECESS BORING ATTACHMENT FOR CLUTCH SLEEVES

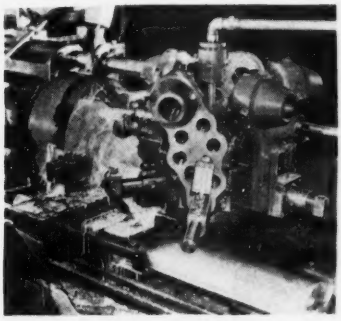
1 Turret Lathe Takes Over Work of 2

Here's how a Fastermatic Automatic Turret Lathe, equipped with a standard recess boring tool, was able to eliminate subsequent operations on a second machine.

On this clutch sleeve, machined from a steel casting, the manufacturer was using two machines to perform the two operations required to finish the bored diameters. A Fastermatic finished the bore, and then the job went to another lathe that did the recess boring.

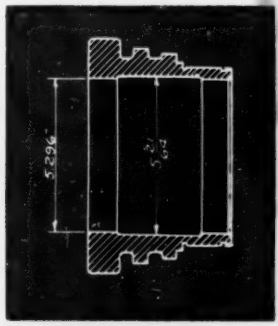
A Standard Automatic Recess Boring Tool was recommended for the Fastermatic—and the job was then handled on this one lathe. Floor-to-floor time was reduced to 8 minutes, 20 seconds, and a second machine and operator are freed for other work. In addition, more concentric diameters are achieved by boring both on the same chucking.

Simply by using a Standard Boring Attachment on his Fastermatic Lathe this manufacturer was able to save an extra machine and operator.



This Fastermatic with standard boring tool does job formerly requiring two lathes.

Rough casting as it goes to the Fastermatic and the semi-finished clutch sleeve.



Drawing shows the 5-21/64" recess handled by the Fastermatic automatic recess boring attachment.

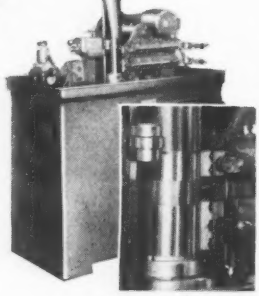
GISHOLT

GISHOLT

TIME SAVING IDEAS

HOW SUPERFINISHING SOLVES 2 PROBLEMS AT ONCE

Two surfaces are Superfinished at same time by this Automatic Superfinisher.



(Left) Close-up shows two sets of Superfinishing stones to handle both oil seal and bearing fit diameters.

Assures Oil Seal and Protects Bearing Fit on Variable Pitch Airplane Propellers

Imagine the problems in keeping oil-tight seals on variable pitch airplane propellers.

There are not only the questions of oil pressure and changing pitch, but terrific centrifugal force as well. Superfinish provides a degree of smoothness which makes possible and protects the nicely fitted oil-tight bearing of the blade in the hub.

Also, the roller bearing at the shank end must be a tight press fit. This fit is insured and preserved through Superfinish, which removes all amorphous smear metal which could break down or score this critical surface.

An Automatic Superfinisher handles both surfaces in a single operation. The 4½" diameter is ground to approximately 30 micro-inches, and the Superfinishing is completed in only 45 seconds—with floor-to-floor time depending on the handling equipment available for the big blades.

Superfinishing, by removing all amorphous "smear metal" on variable pitch airplace propellers: 1. assures oil-tight seals, and 2. permits right press fit of blade in hub.

For complete information on Superfinishing, write for free booklet, "Wear and Surface Finish."

HEAVY FANS BALANCED FOR LONGER BEARING LIFE

Service Problems Reduced

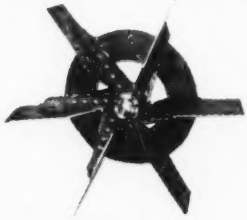
Balancing is just as vital for unwieldly parts, like these heavy fans, as it is for smaller high-speed rotating members.

The Raymond Pulverizer Division of Combustion Engineering-Superheater, Inc., Chicago, knows this. Components of its pulverizing and drying systems are these large fans for exhausting air and materials, such as coal dust. In service, the fans turn anywhere from 900 to 1200 r.p.m. They are fabricated of heavy steel plate and range from 40" to 80" in diameter, and weigh up to 2000 lbs. Production by size runs in lots of from 6 to 10.

The spiders and the entire assembly are dynamically balanced on a Gisholt 3U Dynamic Balancer—to as little as one-tenth ounce inch. The machine gives a direct reading of the amount of corrections required and where they are to be applied with no additional calculations or cut and try procedure. Corrections are made without removing the workpiece and by adding metal weights or deposits of weld metal. Balance is then rechecked.

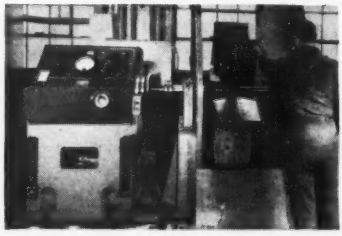
This whole balancing job is thus completed in one operation, on one machine with a minimum of time, cost, floor space and handling.

This 54" balanced fan weighs 1100 lbs.



DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. DYNETRIC IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

Operator marks amount of unbalance on blade.



The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT Balancing School

Because of the fast-growing use of balancing—Gisholt, in answer to industry-wide requests, now offers complete courses in the theory and practical application of balancing. Open to maintenance men, production men, process engineers and others. Class enrollments are limited, write for information now.

No. 651
569

GISHOLT

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

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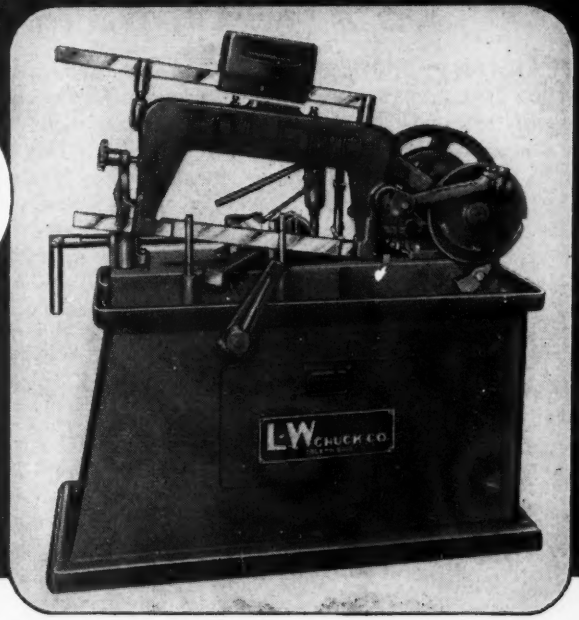

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Special Toolholder Aids In Strain-Gage Measurement Of Tool Loads

By Ira S. Roberts

MEASUREMENT of the components of tool loads on a lathe was among the problems solved by engineers of Jones and Lamson Machine Company in preparation for a broad research program on "carbide high-velocity turning." The methods used and the results of this work were reported recently by Leif Fersing, an experimental engineer, at the annual meeting of the American Society of Mechanical Engineers.

Solution of this problem was based on the utilization of SR-4 resistance wire strain gages which were bonded to a special toolholder and small cantilever beam in such a way as to enable the determination of radial, tangential, and feed forces. SR-4 strain gages are essentially tiny grids of hair wire which, when bonded to a strained member, are strained with the member, thus changing their electrical resistance by measurable amounts. These gages are products of the Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pennsylvania.

Development of a special toolholder for measuring these components required designing for rigidity without loss of sensitivity and accuracy. This factor is provided for by means of a massive tool post having a round hole in which the toolholder was rigidly clamped.

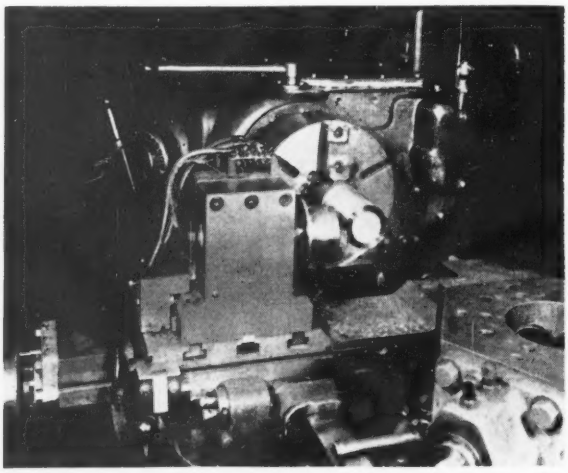

Fig. 1—Tool post and toolholder designed for SR-4 strain gage measurement of tool loads on a turret lathe. Bunch blocks for wiring connections between gages and recorders are on top of the massive tool post. Four strain gages are cemented to the cylindrical toolholder shank in front of the tool post and two are cemented to a vertical cantilever supported at the rear of the toolholder. During tests the tool post, toolholder, and strain gages were enclosed by a sheet steel cover.

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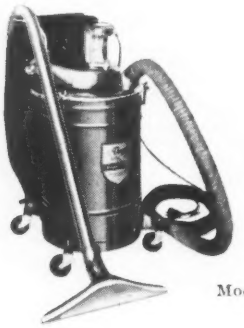

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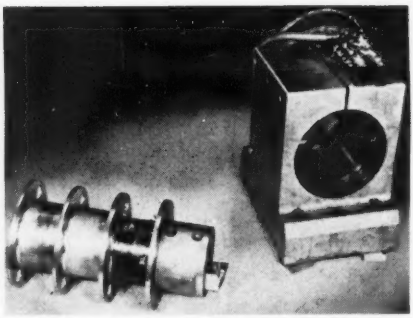
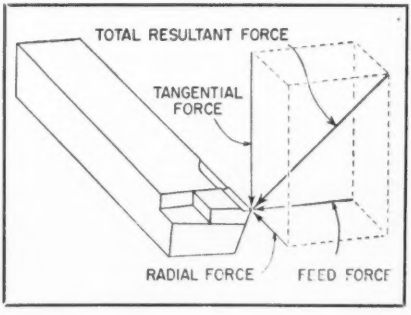


Fig. 2—The toolholder has tape-covered SR-4 strain gages between right diaphragm flanges. The tool post was designed to clamp the toolholder diaphragms. Gage wires are connected to recorder wiring through bunch blocks on top of the tool post.

as shown in Figs. 1 and 2. A slot in the top of the tool post allowed for clamping the toolholder by means of three cap screws. The toolholder was machined from a solid piece of steel, the flanged length being bored and turned to a tubular section. A square hole was provided in the solid end to accommodate 1 x 1-inch tools. The hole was located so that the edge of the tool could be kept on the axis of the holder to minimize errors from torque interference with components of tool loads. An end plate was pressed into the rear

Fig. 3—Components of tool load measured by SR-4 strain gages.



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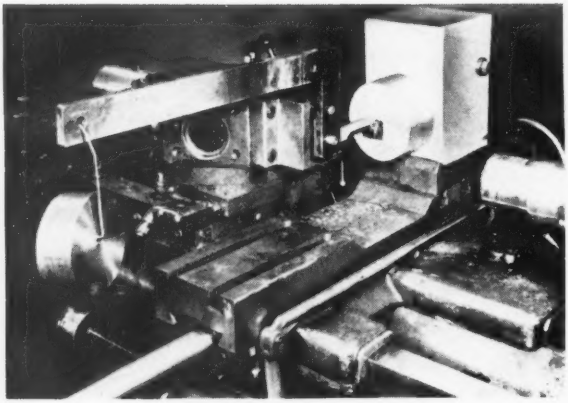

Fig. 4—Calibration of instruments was made with known loads applied in the directions of tool load components. Sheet steel cover for the tool post, toolholder, and SR-4 strain gages is shown in place.

end of the holder and fitted with a steel ball in its center.

Two sets of SR-4 strain gages were cemented to the holder behind the flange nearest the cutting edge. This flange, outside of the tool post, served as a guard for four of the gages. The tangential load on the tool was measured by two gages located on the top and bottom of the holder and the feed load by two gages placed on the sides of the holder. The radial or shank load was indicated by a set of gages located on a cantilever supported on the rear end of the tool post, as shown in Fig. 1, at right angles with the axis of the toolholder. The upper end of the cantilever was in contact with the ball at

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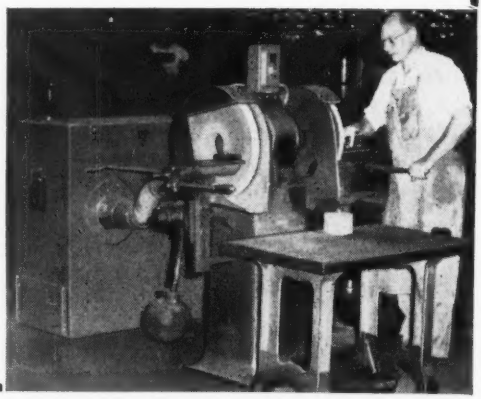

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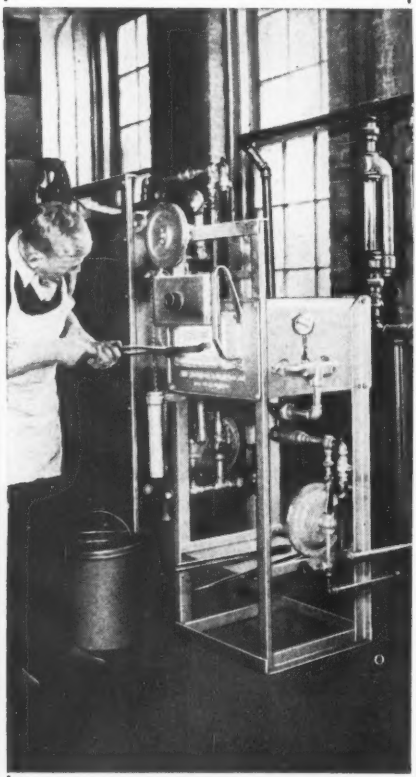

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the rear of the holder and was slightly preloaded in order to assure good contact. The location of the ball was chosen so that bending loads on the toolholder would have a minimum effect on radial tool loads.

The three sets of strain gages on the toolholder were connected to universal analyzers and direct-inking oscillographs, which made simultaneous records.

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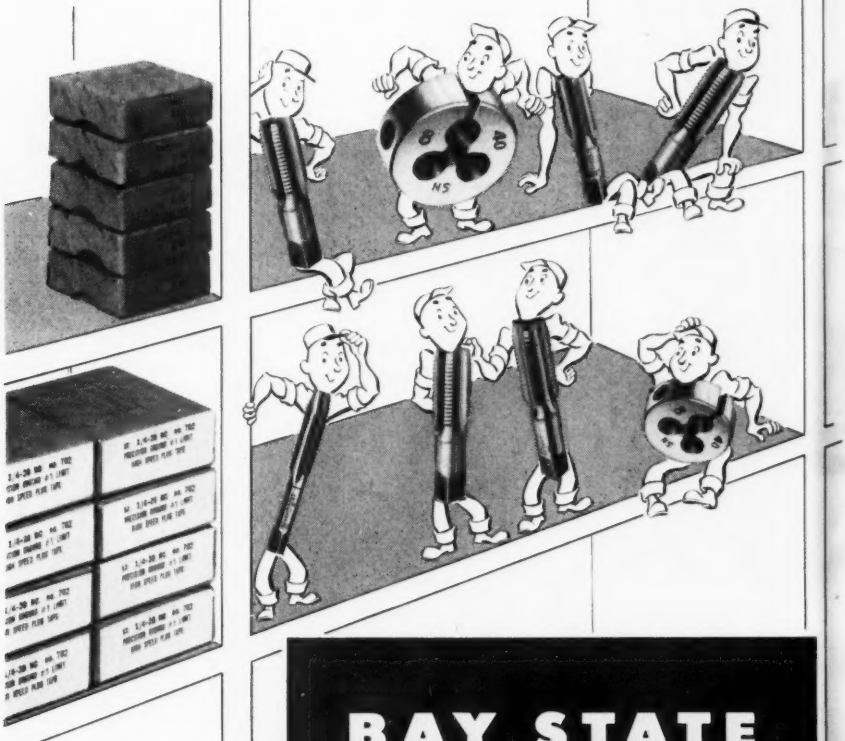

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Jigs and Fixtures for Small Lot Production

In which the author explains the reasoning behind the selection of a specific design for a jig or fixture.

By JOHN T. LANCASTER

HOW often have we heard the descriptive phrase, "He doesn't know what he is doing!" when one man in the field is discussing another man's work, ability, or design. And, too, how many men have been brought up in a machine shop, served an apprenticeship, graduated to the "monkey house" (tool room), and attained an executive position only to be referred to later as "pen pushers". The years of practical experience mean nothing to a new acquaintance, and so we should try to keep contact with the work of the past.

No one can pretend to know or is able to do everything. But, how many times have jobs come up which remind us of similar jobs of the past; and then we can "kick ourselves" because we can only vaguely remember the methods used to iron out the bugs. We should attempt to mentally file our experiences so that they will continue to be useful to us in our present jobs.

However, regardless of experience, we must often be prudent in expressing an opinion on a job, especially when we are dealing with highly opinionated people. And, although we ourselves may also have very definite opinions formed when working on a job, we should continue to keep our minds open to suggestions for improvement. Sometimes, even a new employee is able to find the solution to a bothersome problem (this has been seen many times by the

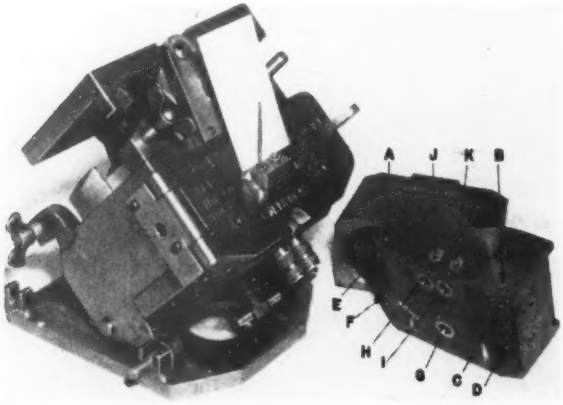
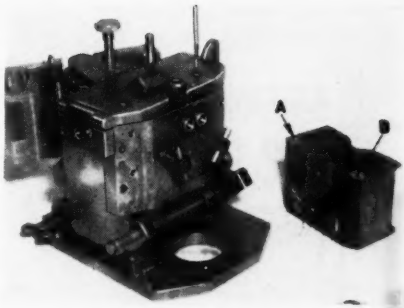


Fig. 1—Illustration showing a drilling jig which was designed for use in drilling eleven holes in workpiece shown at right.

Fig. 2—Setup for drilling holes *A* and *B* in workpiece.



writer); and so, it is well to treat all suggestions with respect regardless of the source.

Dimensions

There is nothing more erroneous than to think that small dimensions which are used for tolerances, such as sixty-fourths and thousandths, are not important. Much time may be lost due

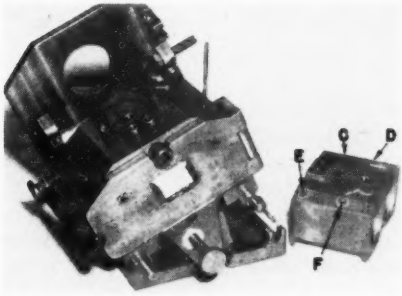


Fig. 3—Setup for drilling holes *C*, *D*, *E* and *F* in workpiece.

to losing and then trying to pick up these "unimportant" dimensions. In the making of tools, jigs, and fixtures, uniform tolerance charts which can be clearly understood should be made available to all concerned. Appropriate charts may be found in various text books to suit particular needs, or charts may be altered slightly to fit the conditions.

The writer has had a considerable amount of success with the method of dimensioning described herewith. If a fractional dimension is shown on a drawing, it is understood to have a tolerance of minus 1/32 inch if an outside dimension, or plus 1/32 inch if an inside dimension. If a dimension is given to three figures after the decimal point, the tolerance is assumed to be minus .010 if an outside dimension, or plus .010 if an inside dimension. Dimensions with tolerances other than these are shown with definite limits. The term, "outside dimension" refers to a dimension for the exterior of a part, such as an overall dimension or the diameter of a shaft; an "inside dimension" refers to an internal dimension of the part, such as a distance between centers or a hole size.

Using limits, an outside dimension

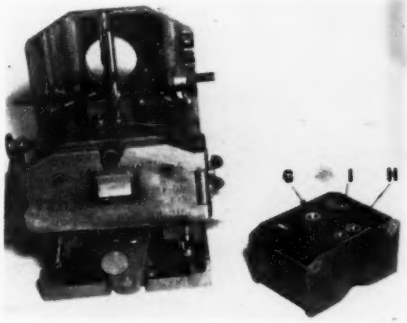


Fig. 4—Setup for drilling holes *G*, *H* and *I* in workpiece.

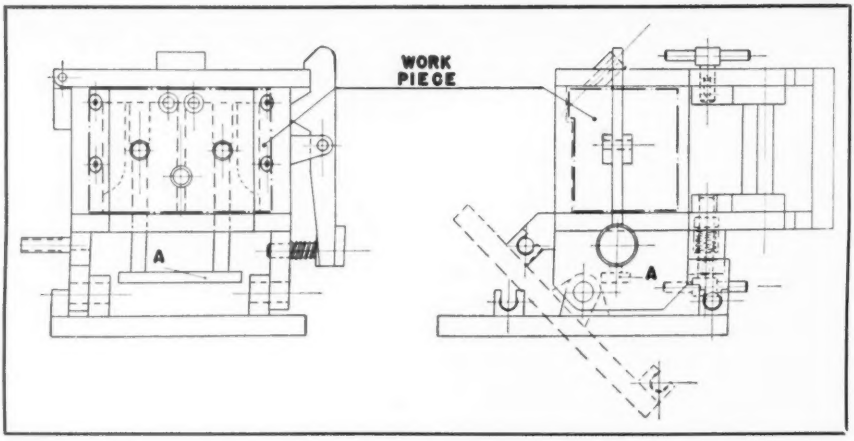


Fig. 5—Drawing of drilling jig shown in Figs. 1 through 4.

is given with the large number at the top, i.e., $\frac{3.999}{3.9975}$ inches; and an inside dimension is given with the small number at the top, i.e., $\frac{4.000}{4.0015}$ inches. The method of listing these dimensions is logical for machining as may be seen by citing examples of a shaft and a hole; the diameter of a shaft is decreased when it is turned down, and the diameter of a hole is increased when it is opened up. If possible, dimensions should be shown unilaterally (tolerance taken all plus or minus from the basic size) in order to help in the use of standard cold rolled shafts, bars, drills, and reamers. To reemphasize, wherever practicable, holes are shown with the basic dimension and with the tolerance plus; thus, for a $\frac{2.000}{2.003}$ inch hole, a standard 2 inch drill or reamer could be used.

It is just as easy for a good toolmaker to

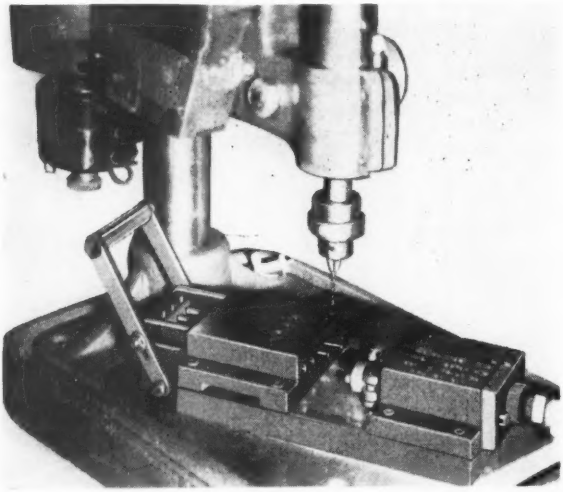


Fig. 6—Illustration showing a drilling jig which was designed for use in drilling holes near end of small pins.

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work to .010 inch as it is for him to work to .032 inch; but, it should be pointed out that many toolmakers waste valuable minutes working to closer dimensions than are necessary. There is no shame in leaving a rough cut when a large tolerance is specified.

which may be made. As an example for this discussion, we cite the workpiece shown at the right in Fig. 1. Excluding the two large holes through the center of the part, eleven additional holes are drilled in each workpiece, drills of four different sizes

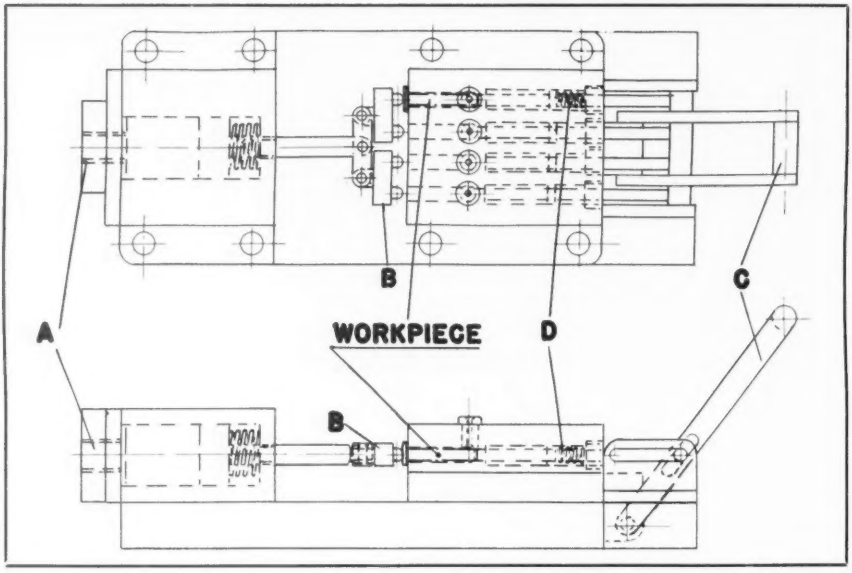


Fig. 7—Drawing of jig shown in use in Fig. 6.

Similarly, such items as hold-down screws should be made to standard designs in reasonable quantities on a turret lathe instead of being made individually; and they may be carried in stock to be used as required on jigs and fixtures. Common sense should be emphasized when making tools.

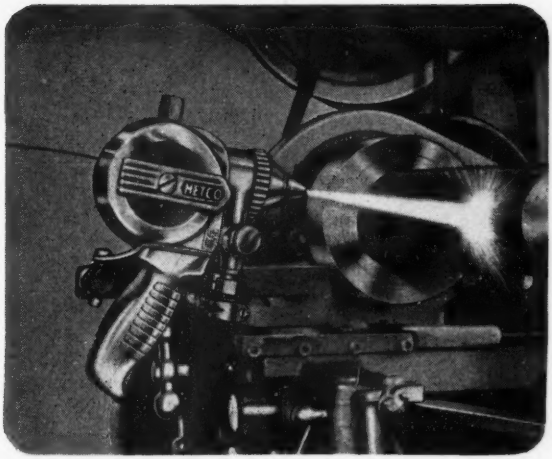
The Number of Tools Required

The number of jigs and/or fixtures required for the completion of a given job is dependent upon several factors, among which are the complexity of the job and the savings in time and money

being used. The holes are indicated by letters.

Two 9/64 inch holes, **A** and **B** as shown in Fig. 2, are drilled two inches deep through the top of the workpiece; four other 9/64 inch holes, **C, D, E,** and **F,** as shown in Fig. 3, are drilled at an angle to meet **A** and **B;** a 25/64 inch hole is drilled at **G;** and two holes are drilled and counterbored at **H** and **I,** as shown in Fig. 4. Holes **J** and **K** are drilled at an angle to holes **H** and **I** to form an L-shaped passage.

Using a previous method, the time required to drill all of the holes in



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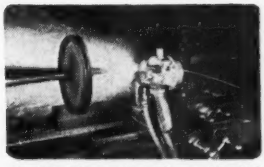

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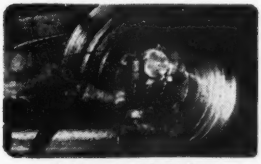

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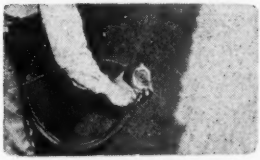

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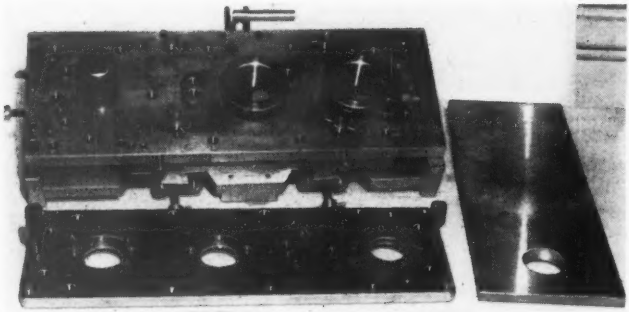

Fig. 8 — Illustration showing a drilling jig in background which was designed for drilling holes in flat bar stock workpiece shown in foreground.

each piece was eleven minutes; and so we asked the logical question, "Was the design and construction of one or more jigs justified?" Let us assume that 500 pieces are produced per year and that, since the cylinder is a standard stock item, the cost of making the jig or jigs be absorbed over a period of three years. We make the following simple calculations:

3 yrs. x 500 pieces per yr. x 11 minutes per piece=16,500 minutes required using old method.

Since the estimated time required per piece is four minutes if one jig is made and used,

3 yrs. x 500 pieces per yr. x 4 minutes per piece=6,000 minutes required using one jig.

By subtracting, we obtain the difference, 10,500 minutes, or 175 hours, which gives the estimated amount of time saved.

Since a good jig could be made in less than 175 hours, and since the cost of making the jig would be less than the cost of 175 hours of labor, it was decided to go ahead with the jig. During actual production after the jig was made, it was found that the drilling of each piece was completed in 3½ minutes; thus, a further saving of 3 x 500 x ½=7,500 minutes, or 12½ hours, was made, giving an overall total of time saved of 187½ hours. It might be mentioned that an additional saving was made during the final assembly of the workpieces due to the accuracy of the parts.

The idea of using four jigs instead of one for drilling the workpieces was given consideration and then discarded

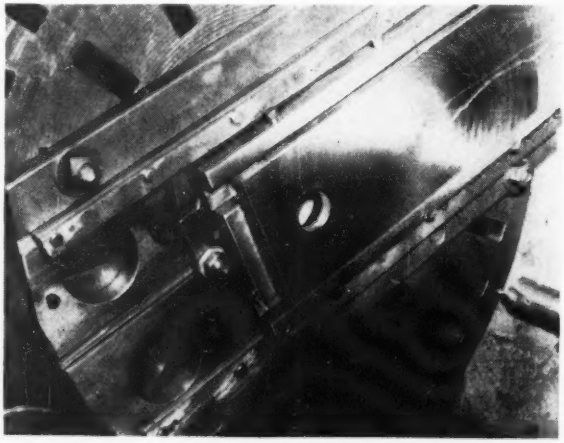

Fig. 9—Facing and boring fixture in position on large gap lathe.

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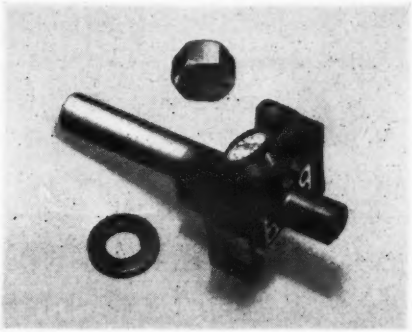

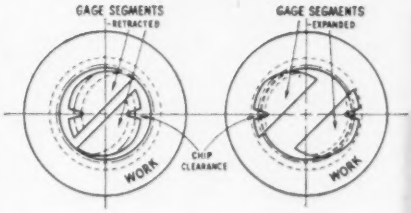

Plug segments are collapsed so gage may be inserted or withdrawn without threading.

Plug segments are expanded to give full length contact on all the threads.

The new Bryant internal thread gage is based on the principle of a split plug gage. The plug segments are collapsed by a thumb lever and inserted into the threaded hole. When the thumb lever is released, the plug segments expand to contact the internal threads in the parts being inspected.

This new gage is portable, therefore, threads may be checked while the part is chucked in a machine, and it offers extra convenience when inspecting threads in large, heavy casting that cannot be moved conveniently.

The Bryant gage is designed to give one accumulated reading of P. D., form and lead on the dial indicator. For the first time it is now possible to sort parts into known classifications for fit (assemble-ability). This gage is used for the inspection of internal threads in a range from 5/16" to 1" diameter. Interchangeable segments are easily attached to the gage to cover a wide range of thread sizes. These segments are made to the same tolerances in P. D., lead, and form as a Class "W" Master. The life of the segments is lengthened by the fact that the gage does not have to be screwed into or out of the threaded hole — a partial turn gives a full reading on all the elements of all the threads.

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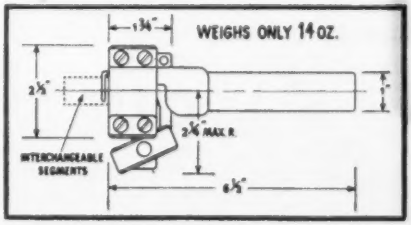

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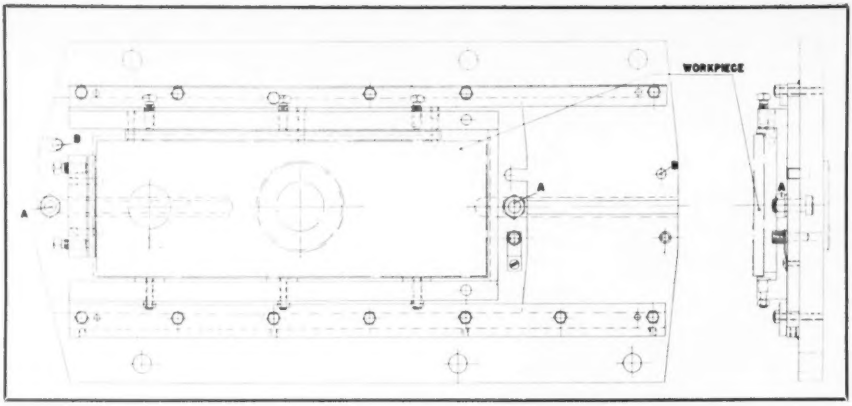

Fig. 10—Drawing showing details of fixture for holding workpiece to face plate of gap lathe during facing and boring operations.

as illogical. To compare favorably with the single jig, only 2½ minutes, or less, could have been allowed for drilling all of the holes since the loading time required for the four jigs was approximated at one minute. This loading and unloading factor is very important—the human element in relocating and handling each workpiece four times must be considered, and the need for more shop boxes and more storage space is increased.

The jig is shown at the left in Fig. 1, and some of the details are shown in the drawing, Fig. 5. The main features of the jig are that it can be swivelled off two planes to four angles very rapidly and that the holes can be drilled on a four spindle drilling machine, the pieces being completely finished before being removed.

Justification for a Design

The illustration, Fig. 6, shows a jig used for drilling $\frac{1}{16}$ inch holes approximately ⅛ inch in from the ends of four pins. The method of drilling these holes was a problem that a designer could really "get his teeth into" as all sorts of ingenious devices are possible—feed troughs, revolving tables, and so on. However, these pins

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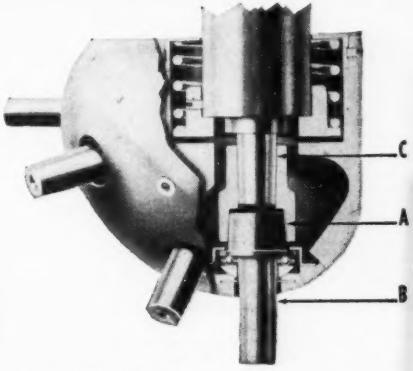

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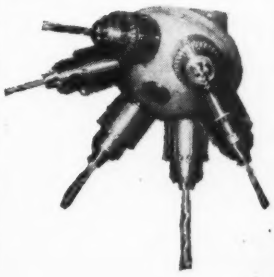

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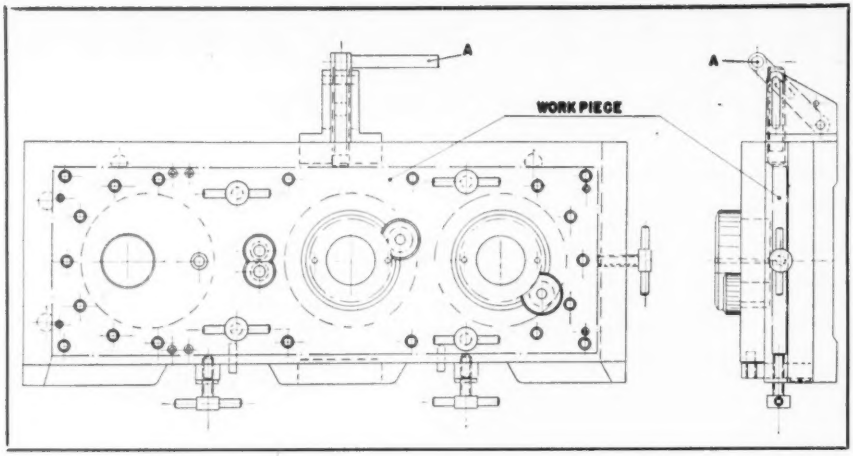


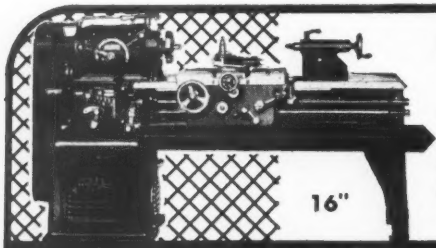
Fig. 11—Drawing of drilling jig with workpiece in position.

were made solely because delivery could not be obtained from the usual source and not as a competition job. Of course, the job had to make a profit.

In the original stages of design, thought was given to drilling the pins one at a time, but this idea was turned down because it was felt that individual drilling would slow up the job. And so, a jig was designed to accommodate four pins and to be used on a super speed, multiple spindle drill running at 25,000 r.p.m., the four pins being completed in 42 seconds.

After the jig had been made, it was suggested again that it would be "quicker to do them one at a time". To prove this point, the pins were placed in the jig, the jig was clamped down, and the holes were drilled one at a time. It was found that, with individual drilling, only three pins could be drilled in 42 seconds. It is too often overlooked that it takes time to operate the controls of any machine.

The main features of the jig are shown in Fig. 7. A foot pedal arrangement is used to allow air to enter the jig at **A.** A one inch plunger is activated by the air movement; and to



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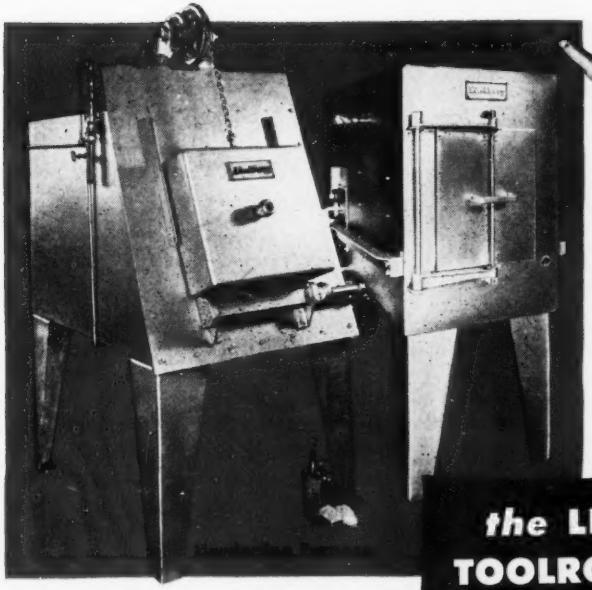

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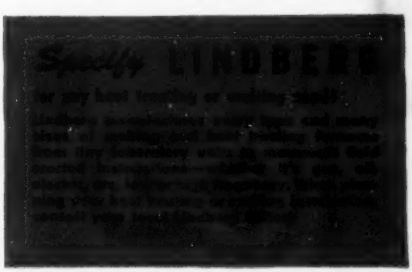

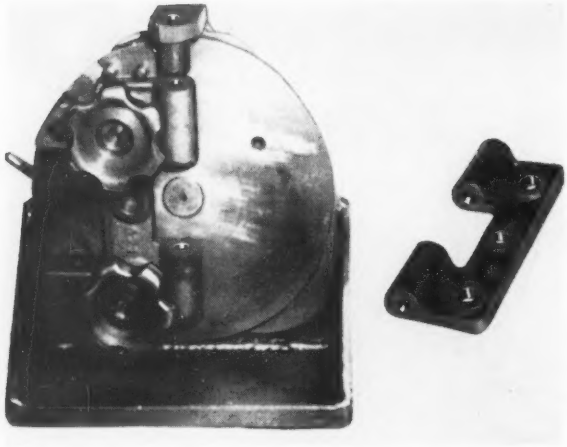

Fig. 12—Illustration showing example of a jig for multiple drilling operations for use on a standard drill press.

this plunger is attached a double jointed, equalizing toggle, **B**, which is used to position the ends of the pins. After the drilling operation is completed, handle **C** is moved towards the operator in order to release the pins; and, if the burrs are not heavy, the spring at **D** will push the pins out of their holes.

The part shown in the foreground of Fig. 8 and its method of machining may be cited as a second example of the justification for a design. The part measures approximately 16 x 5½ x 7/16 inches. The original samples of this part were cast jobs, malleable and cast iron being tried; but warpage, breakage, and other difficulties were encountered which made the writer give some thought to making the part out of a piece of flat bar stock. The amount of money saved by eliminating the cost of a pattern was applied to the cost of making the jigs and fixtures.

It was found that, to duplicate the original casting, a flanged boss would have to be pressed into place in the flat piece. Further study revealed that only one side of the part needed to be faced, a hole being counterbored from the faced side in order to accommodate the flanged boss. The counterbored hole was also to be used to locate the part in the drill jig shown at the rear of Fig. 8. A part which is faced and counterbored is shown at the right in Fig. 8.

Many methods, such as grinding, slabbing, shaping, and large vertical fly cutting were considered for facing

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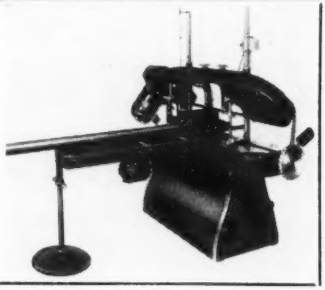

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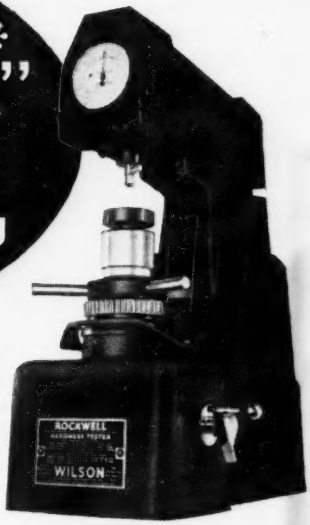

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the part; however, a large gap lathe was not being used to full capacity, and so a special sliding fixture was designed to be used in the lathe for facing the part and also for boring and counterboring the required hole. The part was bored and counterbored in the lathe rather than in the drill jig in order to obtain definite concentricity. An illustration of the facing and boring fixture, with a part in place, is shown in Fig. 9; various details of the fixture are shown in Fig. 10.

When the bolts, **A**, Fig. 10, are unscrewed, the piece may be moved back to the stop pins, **B**, and again secured. This positioning is positive, and the same location is obtained every time. An actual test showed that it takes an average of 2 minutes and 15 seconds to load a piece into the fixture; and, although this operation was performed on an old lathe, the piece was finished faced in 14 minutes and 30 seconds. By comparison, two cuts on a shaper would take approximately 30 minutes to face this part.

Following the facing, boring, and counterboring operations, the part is inserted in the drill jig shown in Fig. 8, and a number of holes are drilled. One of the advantages of the drill jig is that, since the counterbored hole is used as a locating hole, the piece can be placed in and removed from the jig in order to drill each group of holes of the same size in a single spindle drill, or to avoid the use of quick change chucks when drilling the large holes. The part is held in place by means of a 1½ inch pin, two swinging latches, one screw in the end, and four screws on the top, as may be seen in Fig. 8. The handle at the rear of the part,

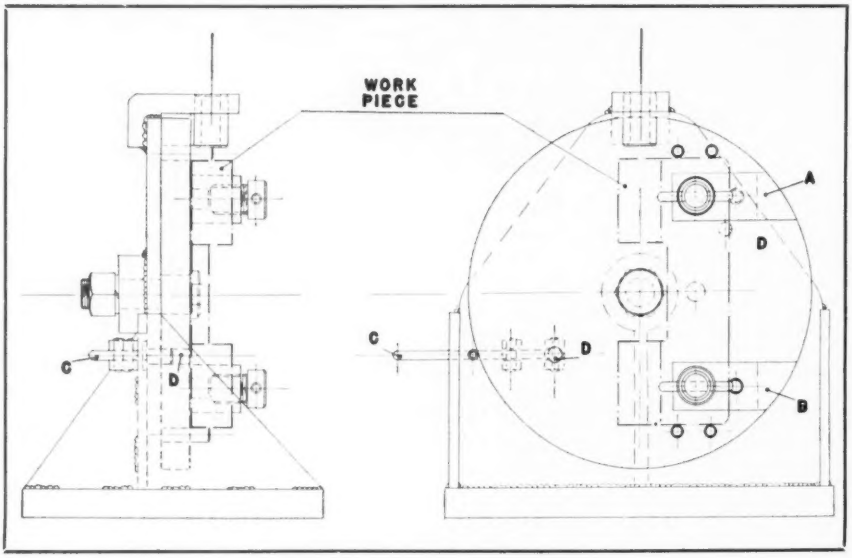

Fig. 13—Drawing of the drilling jig shown in Fig. 12.

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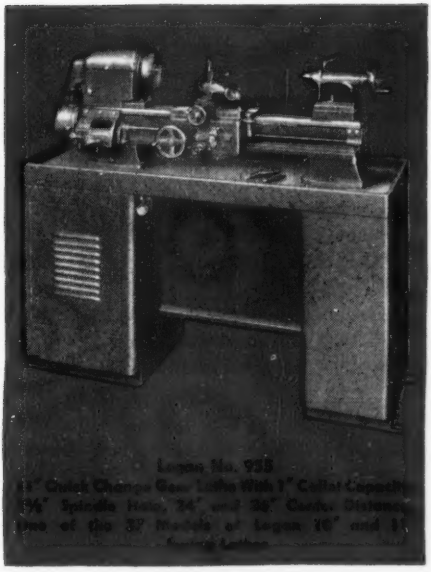

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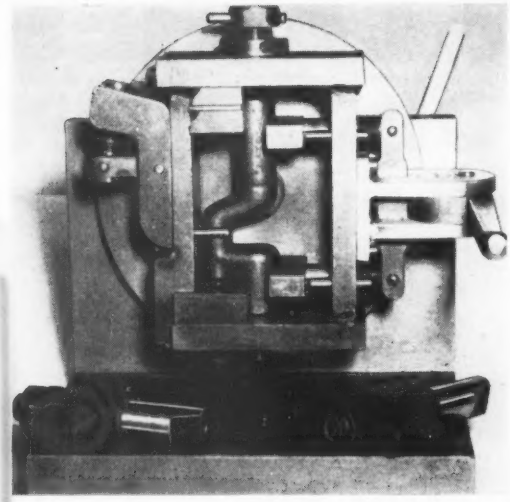

Fig. 14 — Illustration showing jig which was designed to hold the cranks shown during drilling and tapping operations.

which may be seen in detail at **A** in Fig. 11, is used to remove the part from the fixture. The drill jig weighs approximately 60 lb., and to load and secure a part in place takes about 40 seconds.

Multiple Jigs and Fixtures

The part shown in the foreground of Fig. 12 is used as an example for this topic. The part is made of malleable iron, cored, and holes are to be drilled through both projections of the part. It was realized that one of the best possible methods for this job would be to use a horizontal drill coming in from both sides; a jig for such a set-up would be simple. However, the limitations of company equipment must be taken into consideration; and, since the described equipment was not available, the jig shown in Figs. 12 and 13 was designed to be used on a standard drill press.

The main parts of the jig consist of a base plate which is clamped to the table of the drill press; a swivel plate onto which the part is locked in position by means of two screws threading through two small overhanging plates, **A** and **B**; a handle, **C**, which is depressed to swivel the part 180 deg. The movement of the handle controls the movement of a pin which falls into one of two holes, **D**, in order to lock the swivel plate in position. Loading and unloading may be accomplished in a matter of seconds.

In operation, the jig was positioned on the table, one half of the piece was

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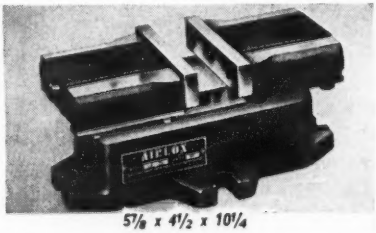

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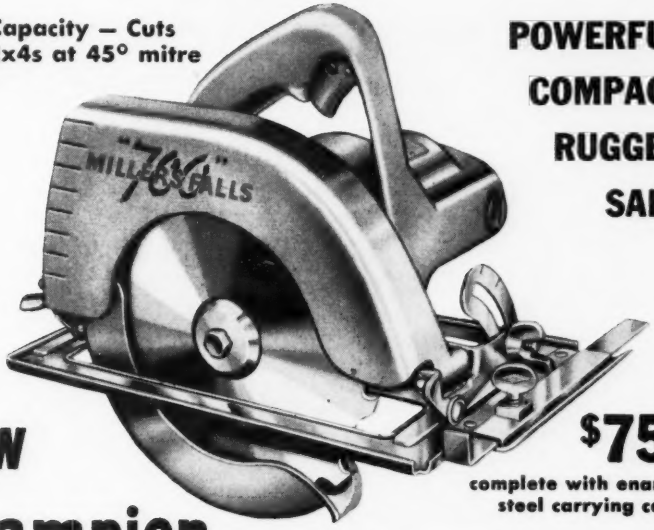

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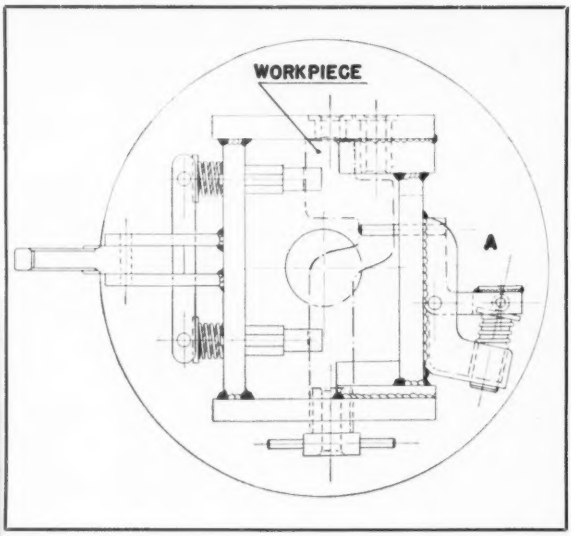

Fig. 15—Drawing of the jig shown in Fig. 14 with workpiece in position.

drilled, and then the swivel plate was rotated and the other half of the piece was drilled. When the work was performed on a single spindle drill, it was found that the operator would stand idle at his machine while half of the part was being drilled, adjust the handle to position the second hole, and stand idle again. Since the time required to drill through each half was one minute, the operator was idle for two minutes during the drilling of each part. It would seem obvious that if another jig were made, and if the two jigs were put on a two spindle drill, much time would be saved.

However, the full two minutes would not actually be saved because, if the operator were not on piecework, he would not watch the gain of one spindle over the other; and so there would be times when the machine would be running free. Nevertheless, it would be safe to assume that the operator could unload and load one jig while a part was being drilled in the second jig. And, even if only one-half minute could be saved on each piece, and only 3,000 pieces were made each year for three years, the time saved would be 4,500 minutes, or 75 hours. Certainly a second jig similar to the one shown in Figs. 12 and 13 could be made within this time and at a lower cost.

Had the amount of time saved been even less so that this could have been

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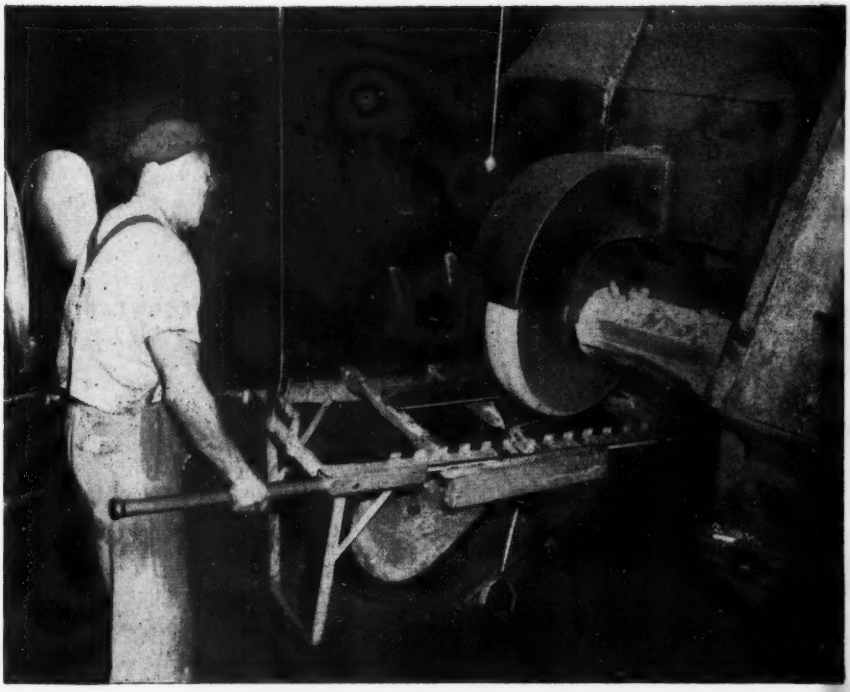

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considered to be a borderline case, we would have considered a point which should not be overlooked—that in these days it is very important to get a job off of a machine and get something else on as quickly as possible in order to increase the margin of profit. A jig which is a borderline-case-type will pay for itself eventually.

In the case of multiple piece fixtures on long bed milling machines, the question is presented, "Why put a number of pieces in a fixture unless two or more can be machined in the time it would take to machine one?" This is a reasonable question until we consider the fact that an operator will many times manipulate a machine only once for one piece and still only once when machining, shall we say, six pieces. In response to the statement, "This is too technical and getting down too fine for some of the smaller plants", we will cite an example.

Let us assume that the average time required to mill a given piece of work is five minutes, of which ten seconds are taken by the operator in manipulating the large mill on which the job is performed. Since 12 pieces are produced per hour, 120 seconds are spent per hour as manipulating time; and in 40 hours, 4,800 seconds, or 80 minutes, are spent as manipulating time. Translated to a yearly basis, the manipulating time on this job is 69 hours.

This is an important figure since, even if the manipulating time could be reduced by one-half, the time required to manipulate the machine would equal almost a week of machining time. The amount, ten seconds, seems rather insignificant by itself; but the accumu-

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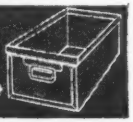

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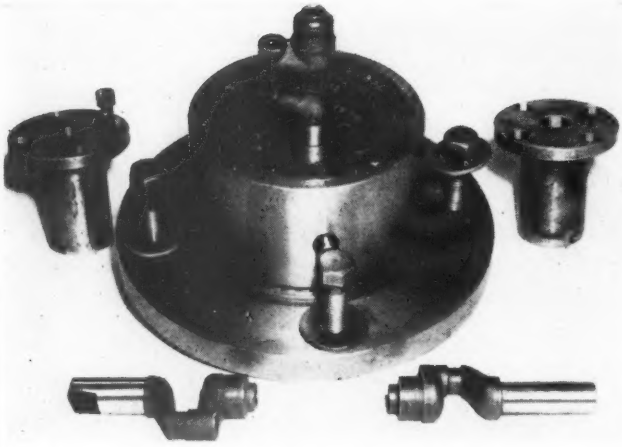

Fig. 16 — Illustration showing fixture which is provided with adaptor to receive various size cranks.

lated sum is an amount to be considered seriously. A definite time and money saving may be made by reducing manipulating time, and one suggested method is to use multiple piece fixtures.

If a fixture is designed so that a machine may be loaded while running, it is necessary to reduce the speed and feed in order to protect the operator and also to provide guards on the machine to protect the operator from flying chips. Thus, in many cases, more is lost by loading a machine while running than would be by filling the machine and letting it cut at the normal speed.

This writer has said many times that we obtain the best results by using collective reasoning. However, we do so only if the individuals concerned are cooperative and have no axes to grind. If one of the members of the group being consulted is domineering, or if there is a long service, "only-one-method" man in the group, the possibility of incorrect decisions is increased. On the other hand, if genuinely cooperative efforts are made by all concerned, suitable solutions may be found for even the most difficult problems which may be presented.

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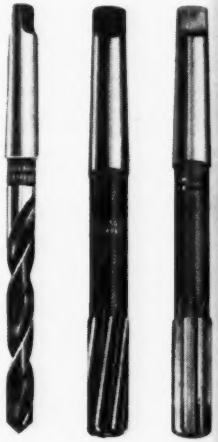

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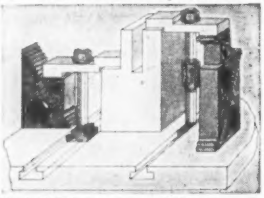

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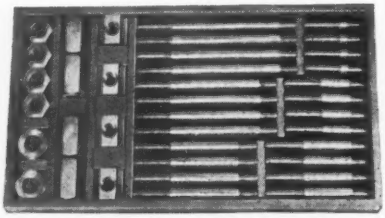

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parts in order to reduce costs. The reasoning may seem over-simple, and so we will cite as an example a group of forged parts which were standardized in order to reduce the cost of forging dies. The example parts are the cranks shown in Fig. 14.

When it was decided to make these cranks, it was found that several sizes were needed. After studying the various sizes called for, the writer found that one forging could be made which, if machined properly, would answer all requirements. One jig, one fixture with four adaptors, and one other fixture for milling, which is not shown, were made for the machining operations. The fixtures described here were used for drilling three holes and tapping one hole in each part. The cranks varied in length from 4 to 5½ inches and in diameter from ⅝ to 1 inch. The saving made by reducing the number of forging dies more than paid for the extra machining cost and the additional metal required.

In addition to the convenience of near identity, all of the cranks have the same offset throw and also the same size holes through both the offset and through the main sections of the crank. The first operations are to drill these holes, and the drill jig shown in Figs. 14 and 15 is used for the job. This drill jig needs very little explanation. A handle shown at **A** in Fig. 15 is used to align the offset throw correctly; and this same handle, being spring loaded, may be quickly lifted out of the way by hand in order to load or unload the jig.

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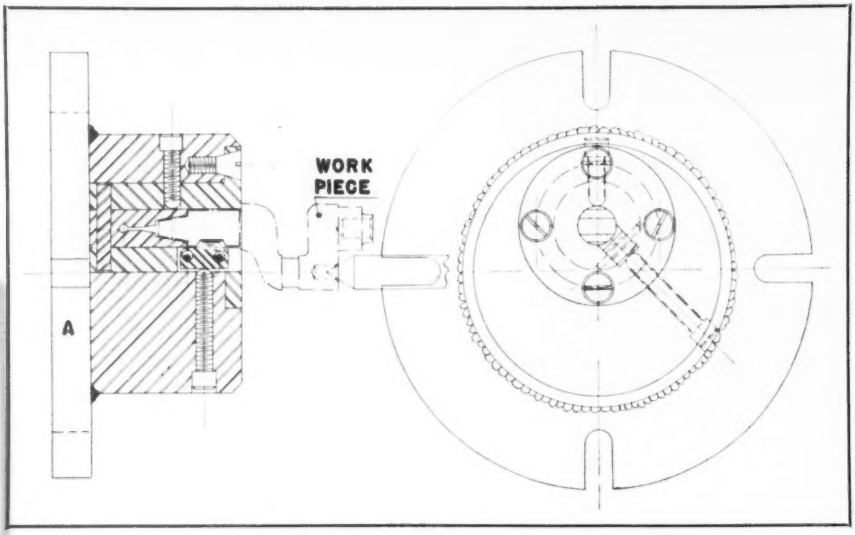

Fig. 17—Schematic drawing of fixture shown in Fig. 16.

rotation is controlled by a spring loaded handle at the rear of the jig, and a cam and toggle arrangement is used to hold the swivelled parts securely in position.

After drilling, the cranks are centered in a lathe, and the long ends are turned. The cranks are then put in the collet of a turret lathe, and the short ends are turned. They are next placed in the fixture shown in Fig. 16 in which the proper adaptor has been screwed. The fixture is fastened in a lathe, and the hole through one of the main sections is tapped. As may be seen in Fig. 17, the hole in the offset throw is used to center the piece. Some idea of the size of the fixture may be gained by mentioning the fact that plate **A**, Fig. 17, has a diameter of $9\frac{1}{2}$ in. The time required to complete all of the machining is approximately 10 minutes.

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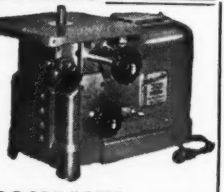

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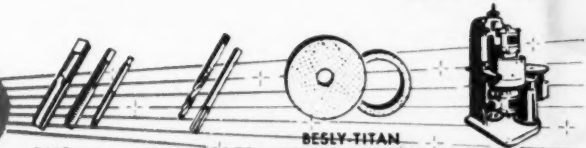

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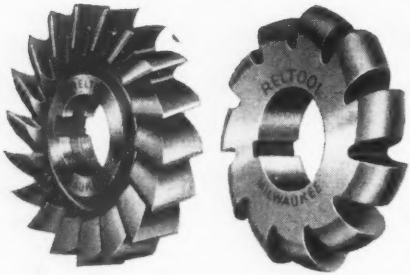

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Conclusion

In conclusion, let us realize that it is not good practice for a designer to rush with a drawing and discover shortcuts only to have a toolmaker waste time in making a fancy job. And, similarly, the designer should not spend an excessive amount of time on a design and then expect a toolmaker to make up for the time lost. Both the designer and the toolmaker should do their jobs carefully and well; neither should destructively criticise the actions, methods, or workmanship of the other; and both should be able to say, "I have made the part to the best of my capabilities. I have studied it and have taken due cognizance of all the facts and conditions. Within limits, I have planned for the future."

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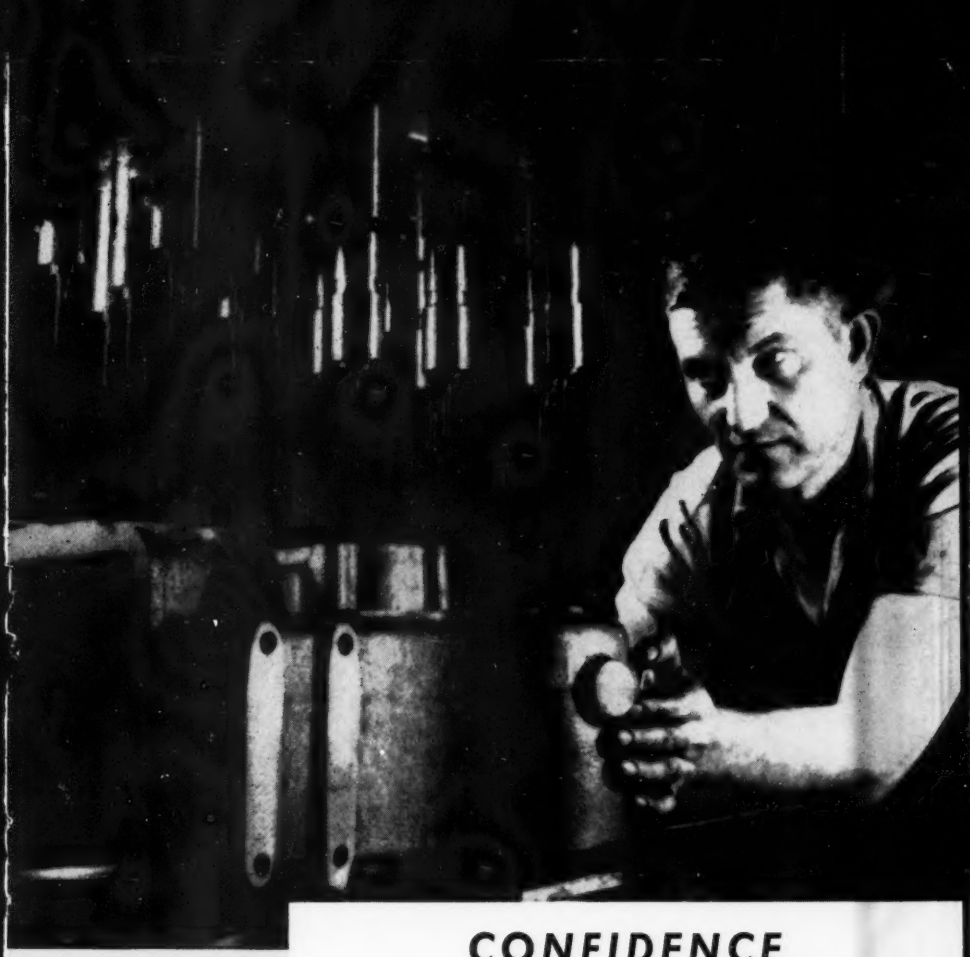

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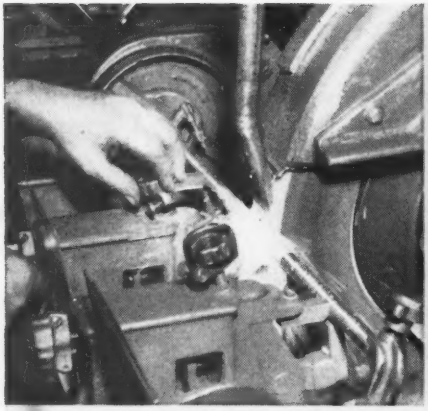

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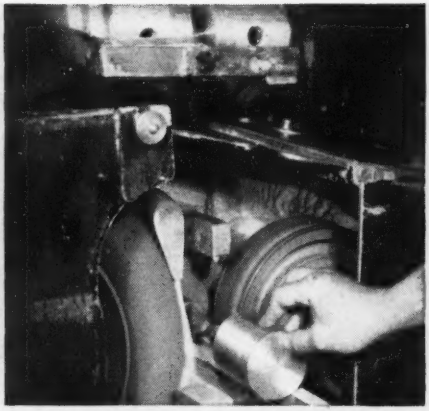

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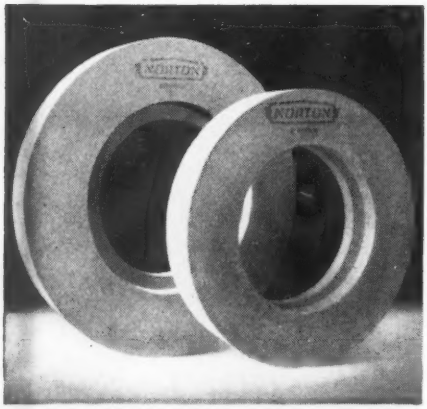

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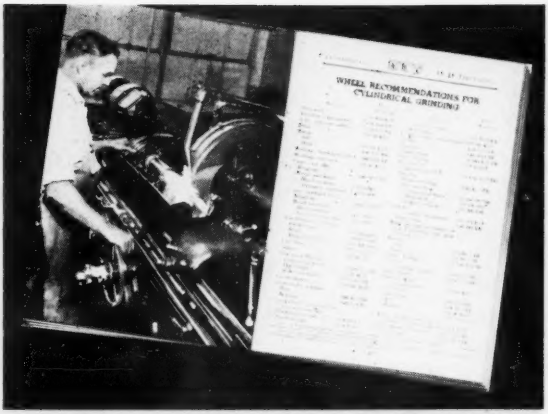

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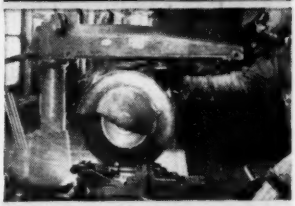

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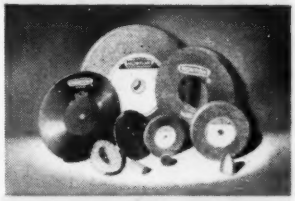

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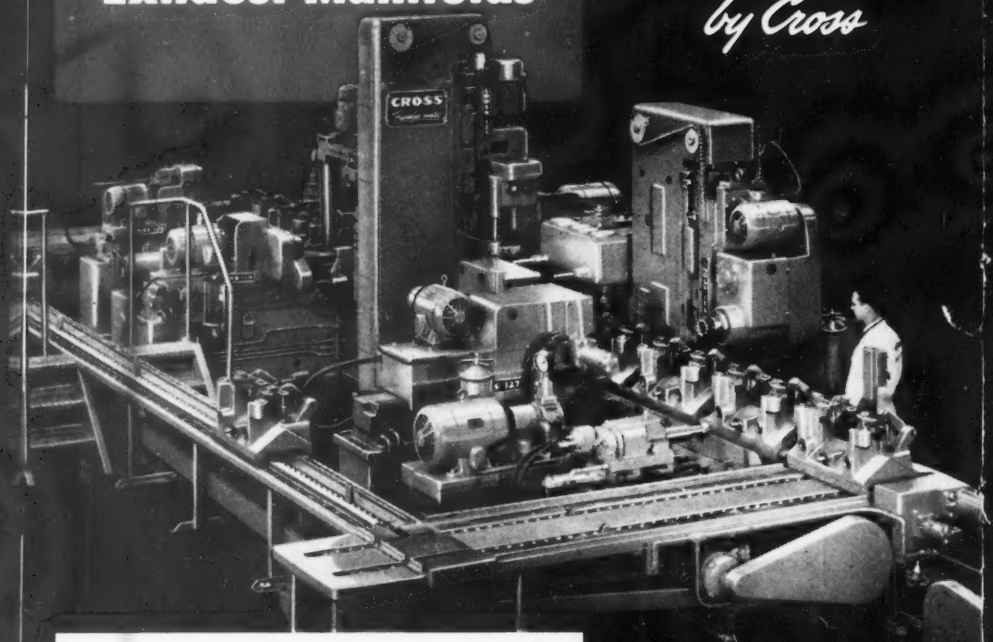

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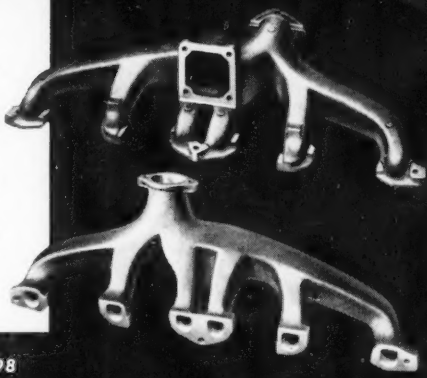

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Fitting The Working Space To The Spring

Some helpful suggestions for those who use springs in their products.

By Fred Rogers

IT has been said many times over that the average machine designer does not read the advertising pages appearing in technical trade papers. This may be due to lack of time or perhaps to the "I don't want to be bothered" feeling. Furthermore, it might be possible that the mechanical advertisements are becoming too prosaic or too stereotyped to compete for his reading time during off-hours away from the job.

However, the alert, well-informed designing engineer certainly can get many a good idea by perusing the advertisements as well as reading the editorial pages. We came across such a good advertisement recently. It contained a bit of psychology that should be taken to heart by every person responsible for the specifications of springs. The first statement in this advertisement by a progressive spring manufacturing concern reads as follows:

"Product designers can save themselves and their firms many an unnecessary headache by first designing the spring to fit the need, then making the working space fit the spring." These are indeed words of wisdom, as many a machine designer will recognize, especially those who have been "through the mill" and learned the hard way.

Too often is the mechanism satisfactorily designed, only to be whittled down here and there in size and strength. Then when the spring, usually the heart and pulse beat of the mechanism, is to be fitted in, the remaining space is so small that spring stresses become dangerously high. Now, what happens in the field, after the job has been delivered? Either the spring weakens and sets, thereby caus-

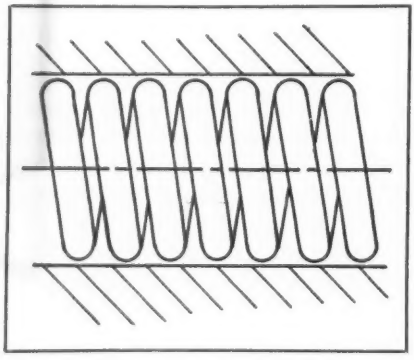

Fig. 1—Illustration showing a portion of a compression spring which is designed for operation within the confines of a drilled hole.

ing sluggishness of movement, or worse still it breaks. Then the mechanism must be disassembled only to remain in that condition while a telegram is rushed to the manufacturer for a replacement spring. After reassembling, the same procedure will repeat itself if the spring has not been redesigned during the interim, for greater strength, safety and service.

If the spring, in this instance a compression spring, is to work in a hole on the one hand, or around a centering rod, shaft or spindle on the other hand, or in some cases where it works both in a hole and around a rod at the same time, the person making the calculations can control his stress and safety factors to the proper degree, if he designs the spring first. Thereafter, and only thereafter, should the diameter of the socket or hole or the size of the rod be decided.

To illustrate this point, Fig. 1 shows a portion of a compression spring working within the confines of a drilled hole. Assuming a standard minimum clearance, between the diameter of the hole and the outside diameter of the spring, the designer can exercise control readily over the wire diameter chosen. By using a table of spring loads and deflections, the valves of which are based on the outside rather than on the pitch diameter he can readily see, without additional calculations, how the ratio of the wire diameter to the outside diameter of the spring compares. If he is working with a minimum inside diameter of the spring, then the socket diameter must increase as the diameter of the wire is increased.

When the spring works around a rod as is shown in Fig. 2, the minimum diameter of the rod will control the various factors of working stress, outside diameter and the general safety of the spring.

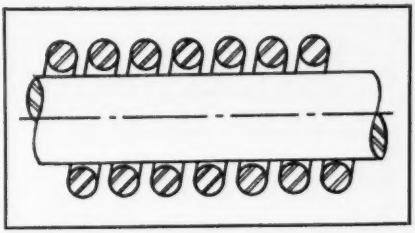

Fig. 2—Illustration showing a portion of a compression spring which is designed for operation around a rod.

Many times the situation arises where both the outer and inner confines of a spring are limited, as in Fig. 3. The spring must fit around a rod and in a hole at the same time. Then indeed does the designer have to use his ingenuity to make his calculations result in a properly designed spring. There are several alternatives that the calculator has at his disposal to rectify such a situation. If the original calculations were based on the use of carbon steel spring wire, he can increase his margin of safety approximately 10 per cent by using oil tempered steel wire.

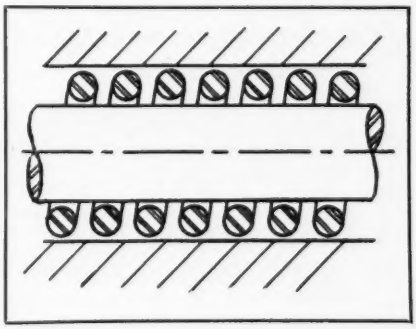

Fig. 3—Illustration showing a portion of a compression spring which is designed for operation both around a rod and within the confines of a drilled hole.

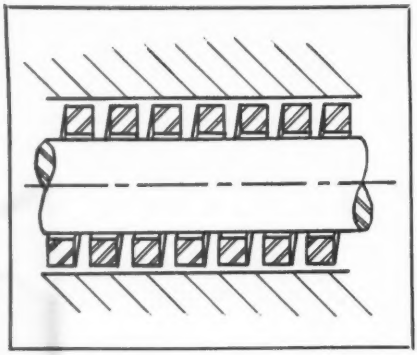

Fig. 4—Illustration showing use of square spring wire in applications requiring operation of the spring around a rod and within the confines of a drilled hole.

This wire has a 10 per cent greater load carrying capacity than that of carbon steel wire.

Usually, however, if the calculations of the original spring are checked, it will be found that the maximum working stress of the wire has been approached too closely when the spring sets on the job. And if breakage has occurred, then the safe figures for working stress have been exceeded. Perhaps this additional 10 per cent would not help materially.

By using chrome vanadium steel, the margin of safety can be increased over carbon wire by about 20 per cent. This figure can be boosted a trifle more if music or piano wire is substituted. This wire is capable of 25 per cent greater capacity over carbon wire, but only when the wire does not exceed ⅛ inch diameter or thereabouts.

If the increase of 10, 20, or 25 per cent does not bring the calculations up to a reasonable margin of safety, then the shape of the wire must be changed from round to square as illustrated in Fig. 4. However, there are limitations

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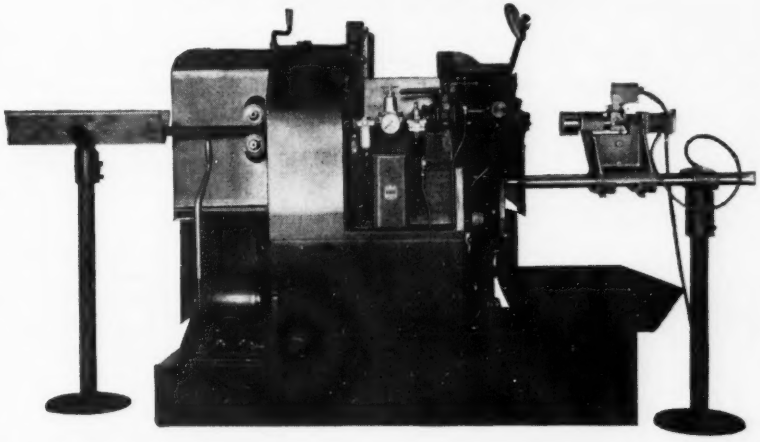

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imposed by this choice. If the same clearances are to be kept as shown in Fig. 3, relative to the diameters of both the hole and the rod, it will be found that while square wire is capable of sustaining greater loads by 20 per cent, the deflection per acting coil is decreased by 30 per cent. If the spring is of a static type the latter value will not have much effect. But if the spring must transmit even a comparatively short movement, a 30 per cent drop can become a serious matter. If the movement is considerable, then it is best that no further thought be given to the use of square wire.

Of late, a silicon chrome spring wire has been offered in limited sizes by spring manufacturers, but it is difficult to obtain. This new material has twice the load carrying characteristics over that of carbon steel wire. However, the engineer should not rely too much on getting springs of this material to extricate himself from the jam in which he finds himself if he designs springs to fit the space instead of designing the space to fit the spring.

The failure of such a small detail in an important mechanism or machine can be as aggravating as it is costly. The actual cost of the spring is of course insignificant compared to the total repair bill. Good will is a quality to be highly cherished in these days. It has been truly and most wisely stated "For the want of a nail . . . etc. . . . a kingdom was lost."

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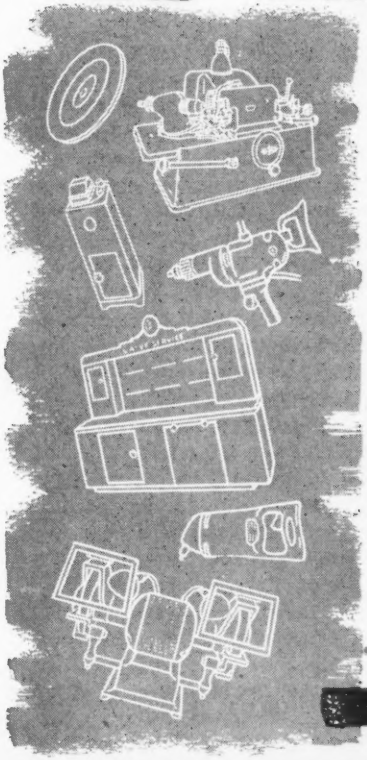

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STANDARD THE WORLD OVER

How To Drill Cast Iron With Carbide Twist Drills

In which the author discusses one of the most important machining and tool developments of the year.

By Fred W. Lucht*

COMPREHENSIVE laboratory tests, followed by actual production applications over extended periods of time, have now clearly demonstrated that cemented carbide twist drills can drill holes in cast iron at least twice as fast as with previously used drilling methods. In addition, carbide drills can be used to advantage even where increased speeds are not possible, it has been demonstrated.

A typical carbide-tipped twist drill such as was used in the laboratory tests and also used in routine production applications is shown in Fig. 1. The drill is made simply by inserting a standard grade 44-A carbide twist drill tip, as shown in Fig. 2, in the end of a conventional high speed steel twist drill. With this type of drill, consistently uniform results are now being obtained, using the same drilling equipment as was formerly used. Precautions to be taken, as far as machine and fixture condition are concerned, do not differ from good practice for other drilling methods. Prime requirement—if it is desired to take advantage of the increased drilling speeds and feeds made possible by carbides—would be that the drilling equipment simply have enough power to take care of the increased rate of chip removal.

* Carboloy Company, Inc., Detroit.

The Drill

Excellent results have been obtained by one of the leading twist drill manufacturers by brazing the tips to the end of regular high speed steel twist drill bodies as one of its regular manufacturing operations. The conventional 118 degree point angle is ground on the end of the drill at a 12-degree lip relief angle, as shown at the left in Fig. 3, by using a 180-grit resinoid bond diamond cup wheel. It is advisable to first remove both the excess steel and carbide with a silicon carbide wheel by grinding a 14-degree clearance angle up to a 1/32-inch wide land as shown at the right in Fig. 3. Longest drill life is obtained when the cutting edges along the drill lip are smooth and keen and without blemishes. Length of the drill lips should be identical. To facilitate a free flow of chips, drill flutes should be polished.

Such drills have been produced both by carbide tool manufacturers and by tool users who have the necessary but simple brazing and grinding facilities. In the latter case, the users have been purchasing conventional high speed steel drills "over the counter" and then

Fig. 1 — Illustration of carbide - tipped standard twist drill.

tipping these with carbide before putting them into service. A silver brazing alloy such as Easy-Flo No. 3 is used as the brazing material, as with other types of carbide tools. An 8 degree R.H. spiral at the drill lip increased to a 15-degree R.H. spiral for the flutes through the drill body provides for a free movement of chips out of the hole.

Drilling Equipment

As mentioned, special drill equipment either as to machines or fixtures is not required to take advantage of carbide drills. The same equipment can be used as for other types of drills, providing these machines are equipped with power feed and have sufficient power reserve. Speeds or feed rates can simply be stepped up so that increased output is obtained in addition to the longer tool life. It is not good practice, however, to increase speeds or feeds if the motor is overloaded to the extent that it slows down the spindle during the cut. Similarly, clutches should also be checked under these conditions. If an increase in motor load should produce tendency for the clutch to slip, drill life obviously would be affected.

Radial drill presses are well suited to the use of carbide twist drills for drilling of cast iron. As with other drilling methods, desirable precautions include keeping spindle end play to a minimum and checking the alignment of drill jig bushings with an indicator if drill bushings are used. With regard to drill holders, best practice is to fit the drill directly into the spindle socket or into reducing sleeves. Quick-change types of holders can be used, but floating holders are not recommended. Spindle nose sockets, reducing sleeves and drill shanks should be kept free from burrs to maintain drill alignment with the guide bushings and to keep the drill running true.

Speeds and Feeds

In drilling cast iron with carbide twist drills on conventional equipment, practically any speed in the range of 75 to 200 s.f.p.m. provides for good results. There is no necessity for reducing feeds when higher speeds are used with carbide drills. The selection of drilling speed (within the range of the equipment) therefore simply becomes one of balancing the increase in output against the increase in drill life desired.

Indications are that there should be some relationship between the depth of holes being drilled and the drill speed used with twist drills having brazed-in carbide tips. Speeds as high as 200 s.f.p.m. with 0.013-inch feed per revolution have been used while drilling $\frac{13}{16}$-inch diameter holes up to 5½ inches deep from the solid, without any sign of breakdown of the braze from the increased temperature developed by the longer drilling period and the greater accumulation of hot

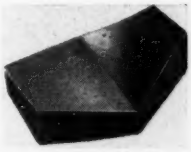


Fig. 2 — Close-up of standard Carboloy twist drill tip.

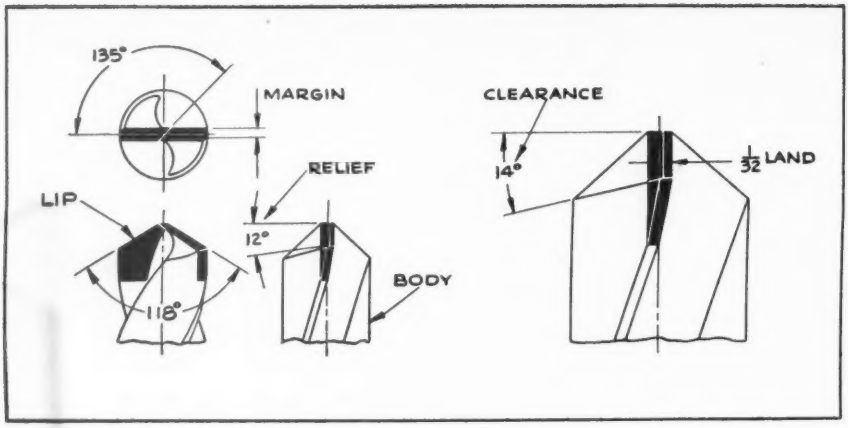
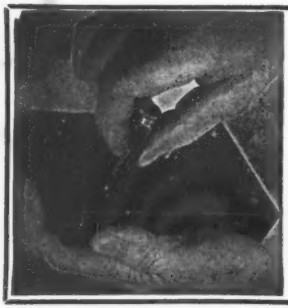


Fig. 3—Sketch showing dimensions and angles of carbide-twist drill that are recommended for the drilling of cast iron.

chips. For drilling holes much deeper than this, it might be advisable to use somewhat lower cutting speeds when starting a job—at least until experience has demonstrated that higher speeds will not affect the braze as a result of the increase in operating drill temperature.

Drill feeds between 0.008 and 0.013 inch per revolution have given good operating conditions on quite a variety of jobs. Lighter feeds are not usually advisable. They seem to contribute at times to an erratic cutting action evidenced by objectionable vibration or "sing". Such vibrations seem to encourage a breakdown. If a carbide twist drill on a job does vibrate or "sing", best practice is to **increase** the feed per revolution. In general, this will not only afford quieter operation but will also increase the number of holes per grind of the drill. In addition, the number of grinds will also be increased, usually, since less material has to be removed in sharpening a carbide twist drill that has been operating properly.

In general, it might be said that it is better practice to increase output



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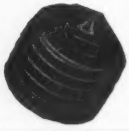

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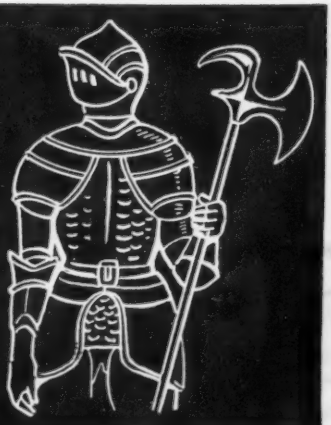

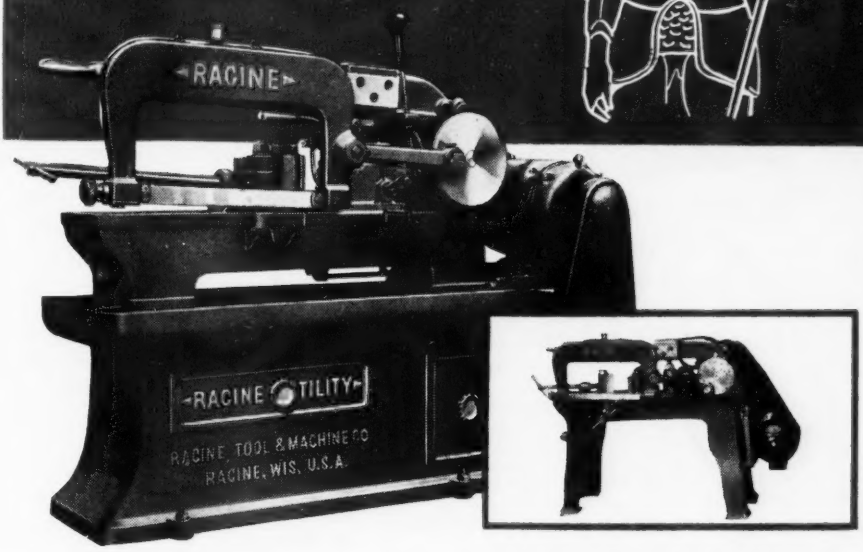

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with carbide twist drills by first increasing feed rather than speed—particularly if the equipment, operating conditions, or material being drilled do not permit the increasing of both speed and feed. As a matter of fact, output can be increased more effectively (with maximum tool life) for the harder cast irons by retaining the same speed but increasing the feed per revolution.

Operating Conditions

It is always good practice to start drilled holes from machined surfaces. This aids in maintaining accuracy of hole location and also contributes to longer drill life. When carbide twist drills are used in setups not employing bushed drill jigs, it is advisable to spot drill. The conventional practice of center punching followed by spot drilling is quite satisfactory for carbide drills, too. If desired, the spot drill can also be carbide tipped so that the operator will not have to change spindle speeds on the machine. Carbide spot drills preferably should be as short as possible to ensure that the holes will be located in a manner that will provide for minimum run-out. Where this general practice is followed, quick-change toolholders commonly used with both spot drills and regular drills fitting the same collet are quite satisfactory with carbides.

Whenever possible, it is desirable to drill

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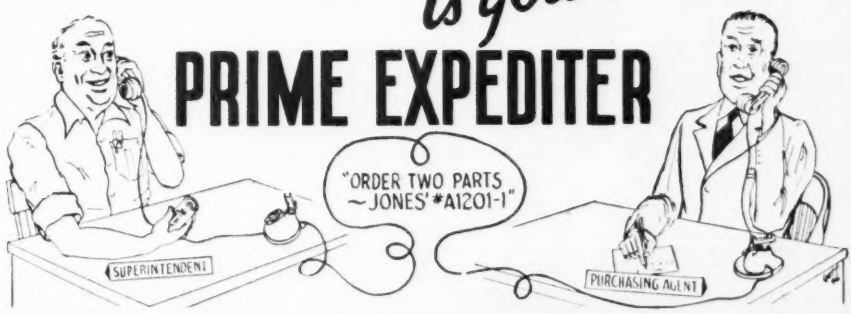

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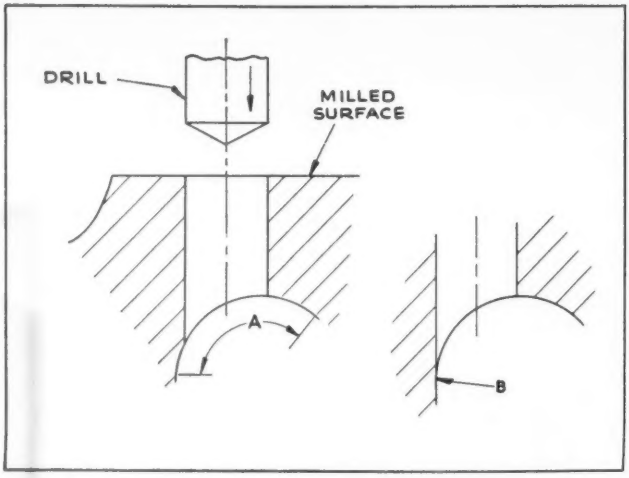

Fig. 4—Sketch showing application of carbide-tipped twist to job involving bad work conditions.

holes in cast iron parts from the solid instead of using them to enlarge a cored opening in the casting. Frequently, the shifting of cores during the casting operation in the foundry results in an uneven stock removal. This, in turn, causes a decided drill runout which, combined with the fact that the drill lips near the drill margin are working in rough, scaly and sandy work surfaces, may result in chipouts and excessive wear. This, of course, shortens drill life.

When setting up a new carbide drilling job, it is advisable to record the number of holes drilled for a given set of speed-feed conditions for several runs to obtain the trend of holes per grind. Two or three trial runs may be necessary to determine the most effective speed range. At no time should the drills be allowed to become excessively dull, thereby causing complete drill failure.

This data can then be used not only to determine best operating conditions but also to indicate the number of holes after which a drill should be removed for sharpening. Usually, the best thing to do is to set the drill-change time at 50 to 100 holes less than the minimum obtained in the trial runs. As with other carbide tools, carbide twist drills should be removed for sharpening **before** they become really dull, if maximum continuity of production and maximum overall drill life is to be ob-

NO MORE COSTLY JIGS

on small production jobs with

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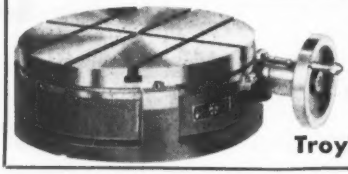

Sizes:
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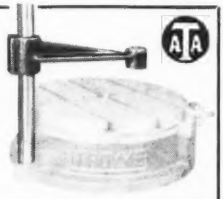
See your dealer or write for Catalog No. 17, fully illustrated, showing all models and applications to various work.



Drilling attachments can now be furnished for Worm Wheel Operated Tables.

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tained. The consistency with which carbide drills operate when correctly applied makes this practice entirely feasible. For instance, on a tough job where drills had chipped after runs of 750 holes per grind, no difficulty was experienced when the drills were changed after each 700 holes.

Cutting Oils and Coolants

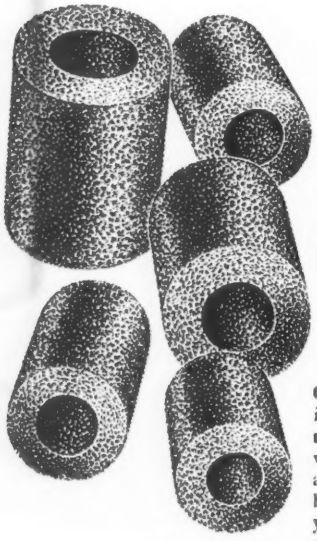
Practically all drilling of cast iron parts to date has been done dry since this practice holds the range of temperature fluctuation to a minimum, thus contributing to longer drill life. In those cases where a coolant must be used, a soluble oil solution will be satisfactory. However, the shock from the coolant hitting the hot carbide as it is pulled out of a hole where it was covered with hot chips may reduce the number of holes per grind, as well as shorten drill life. Under such conditions, operating the drill in the lower portion of the carbide drill speed-range will lower the cutting temperature and improve drill life.

An automatic valve arrangement whereby the coolant is shut off just before the drill is pulled out of the hole and is turned on again just before the drill starts to drill will also prove helpful. A typical operation to which this applies is on machines where coolant is necessary because of other simultaneous machining operations.

Drilling Other Materials

Such materials as ordinary cast brass and bronze also can be drilled with carbide-tipped twist drills at the higher cutting speeds and feeds.

These carbide twist drills have not as yet proven satisfactory in the drilling of steel and are not recommended for that purpose. For such materials,



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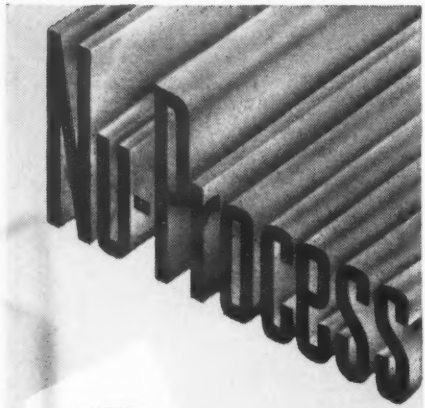

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modified gun drill styles such as the "all-depth" type of drill are preferable. For holes above 1¾ inches in diameter or thereabouts, carbide trepanning tools offer highly interesting possibilities for faster drilling of steel.

It is believed that the figures on drill life, etc., in this article are quite conservative. They are based on actual production conditions. Much higher ratios of tool life have been obtained with carbide twist drills of course. Fig. 4 shows a setup where the drill entered a cast iron part on a clean surface but left the cut through a rough, scaly and sand-impregnated surface "A". In some cases, a slight shifting of the cored surface caused the troublesome condition shown at "B" in Fig. 4, which placed excessive wear on drill lips next to the drill margins. The carbide-tipped twist, however, produced 750 to 1000 holes per drill grind, in spite of the bad work condition at "B".

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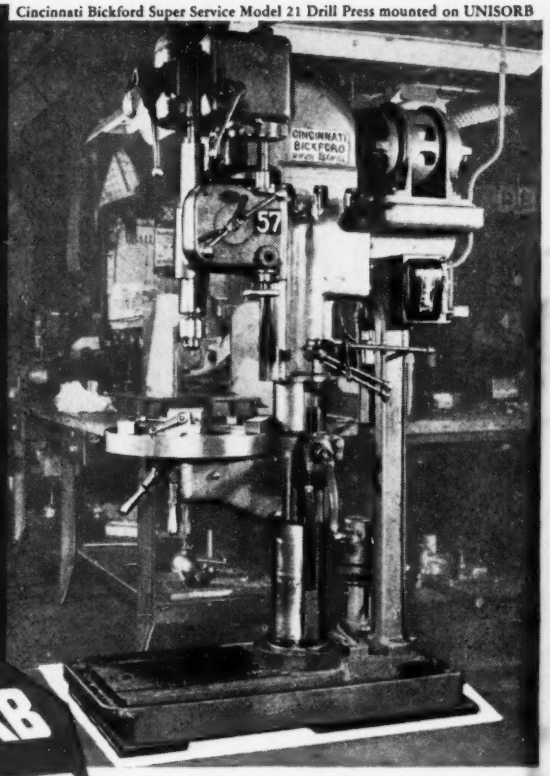

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Little Chats On Practical Psychology

Number 2—Don't Let The "Tough Guy" Scare You

EVERY organization is cursed with one or two individuals who seem to like to "fight" just for the fun of it. Sometimes this individual will go so far as to be the local "hard guy" who virtually resorts to physical violence in establishing his supremacy. More commonly, he simply likes to bluster, make a belligerent and argumentative noise. Frequently he is opinionated, obstinate, wants his own way.

Here is the worker — or supervisor for that matter—who examines every newcomer critically and comments caustically as to his size, color, weight, eyes, and probable ancestry. He hears of a new company policy and picks it to pieces verbally by the hour. "Why don't they ask the workers about things like that before they do it? When the present boss's daddy was here such a thing would never happen. They ought to know better than that."

This man really is not much of a thinker. He thinks he thinks, but actually he acts almost 100 per cent on his emotions and prejudices. Sometimes this apparent toughness is a carry-over from a lifetime of dealing with people on the basis of yelling for whatever he wants until he gets it. Sometimes it is just a cover-up for his own timidity and fear of being thought "easy" or stupid.

When dealing with this individual, first try to determine in your own mind whether he is really tough — prone to physical violence —or whether he just wants to hand out a lot of tough-work to put over his own importance. If he is hot-tempered and inclined to violence, he actually may be a lot easier to deal with and get good work from than the loud-mouth.

If he falls into the latter category, realize first that you cannot put across your ideas or enlist his enthusiastic support by winning an argument with

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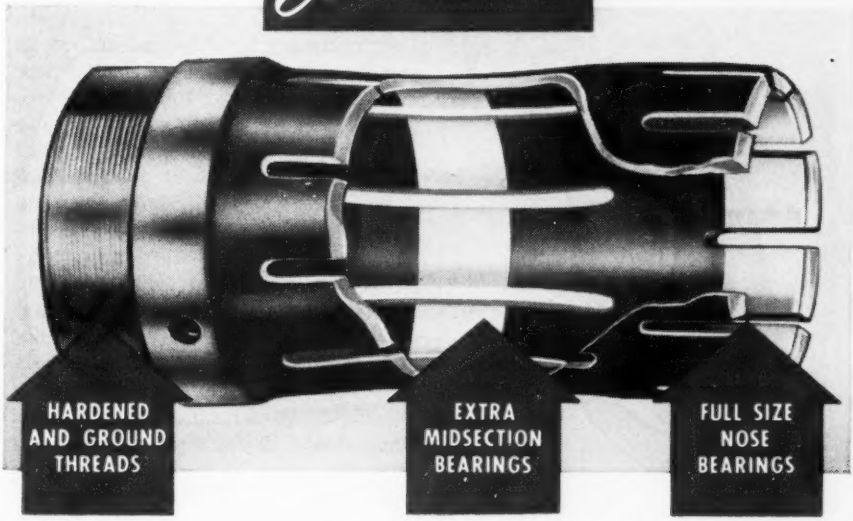

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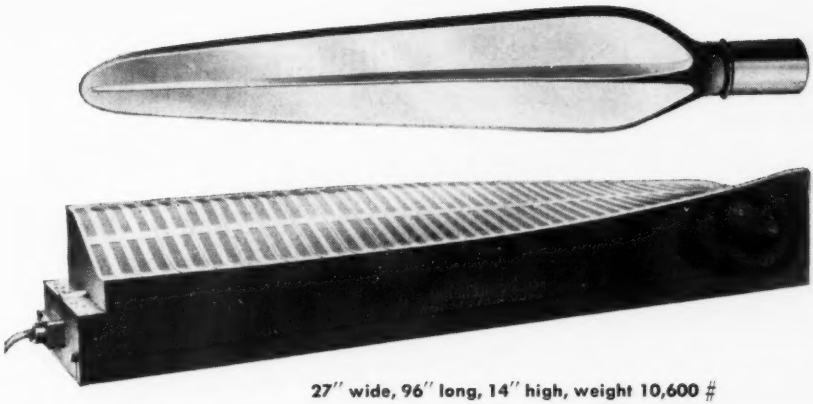
him. He knows all the answers and objections, anyway, and appreciates your giving him a chance to air them, especially before an audience of other workers.

Take this individual off for a private conversation where he can afford to quit acting tough without losing face in public. Then listen to his ideas carefully. Turn any "argument" into a friendly discussion. Draw him out until you have a clear idea of the real emotions and feelings underlying his present actions. Capitalize on these in selling him your ideas.

The big thing is to avoid trying to act tough yourself, either with him privately or in public. Remain friendly and calm, stating your own ideas simply and clearly in such a way as to appeal to his own inner desires. Your own display of self control will soon calm him down to the point where he begins to act like a reasonable human being.

Above all, don't get yourself involved in arguments. Your job is to get his cooperation, to get him to do his job correctly and efficiently. Sticking right to the main issues on a calm and friendly basis is the easiest way to handle the "tough guys."

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.



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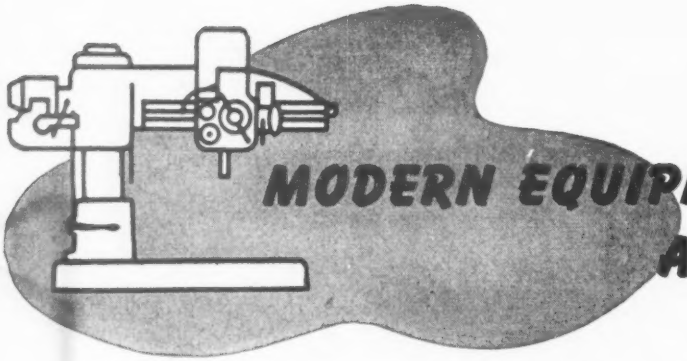

MODERN EQUIPMENT AT WORK

Ram Counterbalances Assure Smooth and Safe Punch Press Operation and Reduce Wear

A COUNTERBALANCE cylinder installed on the average punch press has been found to assure smoother action, reduce wear, and increase the safety of the overall machine performance. The pneumatic type counterbalance cylinder provides overall flexibility and control, as shown in Fig. 1, to eliminate falling of the press ram due to its own weight and the weight of the attached tools. The change of weight of the tools introduced into the machine is corrected by increasing or decreasing the air pressure applied to the installed counterbalance cylinders. On larger power presses, it is advisable to use two counterbalance cylinders. These two cylinders usually have a capacity for holding the ram in suspension with a safety factor, based on 100-lb. air line pressure; however, 25 to 35 lb. usually is the maximum pressure necessary to make them function in a satisfactory manner.

Often, excessive pressure is applied to the brake to eliminate falling of the ram. This, of course, is unnecessary

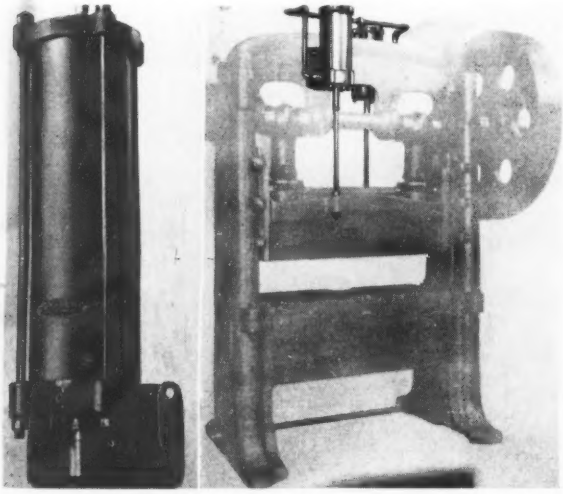

Fig. 1 — Pneumatic counterbalance cylinders, such as shown at the left, are available from stock in cylinder diameters from 5 to 12 inches and with a maximum stroke of 26 inches, and can easily be mounted in pairs or singly on the crown of the press, as shown at the right.

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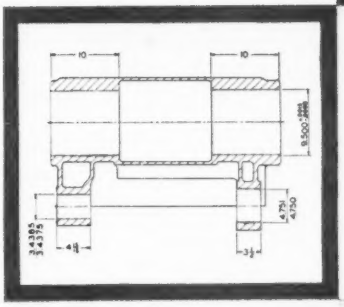

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PART—Spindle Head—Pipe Threading Machine
MATERIAL—Cast Iron

Sequence of Operations—With part mounted on standard JIGMIL Index Table,

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2. Finish bore 9.500" diameter and chamfer boss.
3. Rough and finish bore 4.750" diameter.
4. Index 180°.
5. Rough and finish bore 3.438" diameter.
6. Rough bore 9.500" diameter and face boss.
7. Finish bore 9.500" diameter and chamfer boss.

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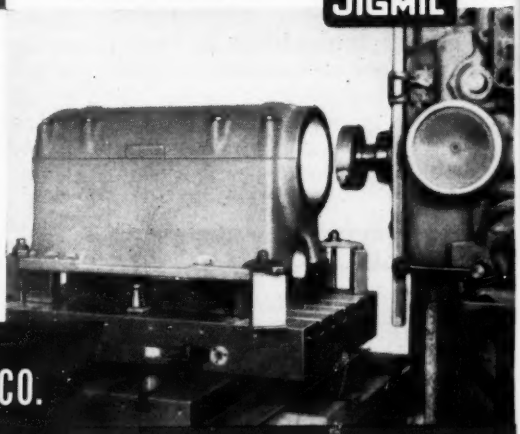

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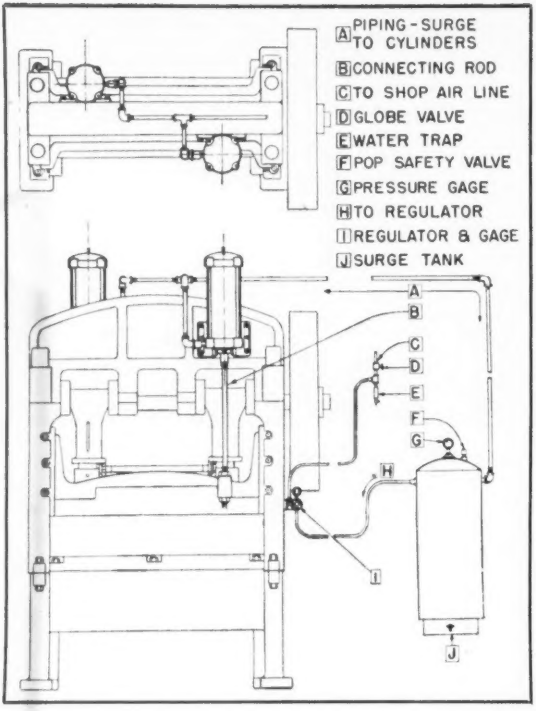

Fig. 2 — To eliminate excessive cylinder air pressure at the bottom of the stroke of the press, a surge tank can be introduced and piped to one or both of the counterbalance cylinders.

when the correct size of counterbalance cylinder is used which eliminates brake wear and adds materially to the safety of all reciprocating parts of the punch press clutch and ram. Overriding of the ram in mid-stroke usually occurs when unusually heavy tools are fastened to the ram section. This is overcome by simply increasing the air pressure on the counterbalance cylinder which eliminates all backlash of the ram mechnaism to a minimum.

A surge tank can be introduced and piped to one or both of the counterbalance cylinders, as shown in Fig. 2, to eliminate excessive cylinder air pressure at the bottom of the stroke of the press. The stroke capacity of the cylinders is usually the stroke of the press plus the adjustment of the ram. A combination reducing regulating valve and pressure gage is applied to the cylinder line to maintain constant pressure on the cylinder, or cylinders, compensating for probable leakage during the cylinder piston work cycle.

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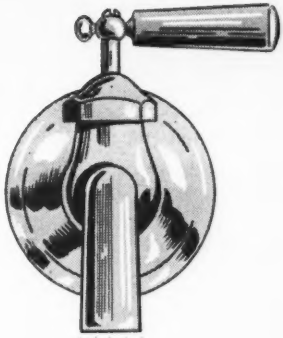

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Spring counterbalances, such as shown in Fig. 3, are sometimes standard equipment on certain size presses. Coil spring **A** will definitely correct the overriding of the ram; however, when the ram adjustment is raised or

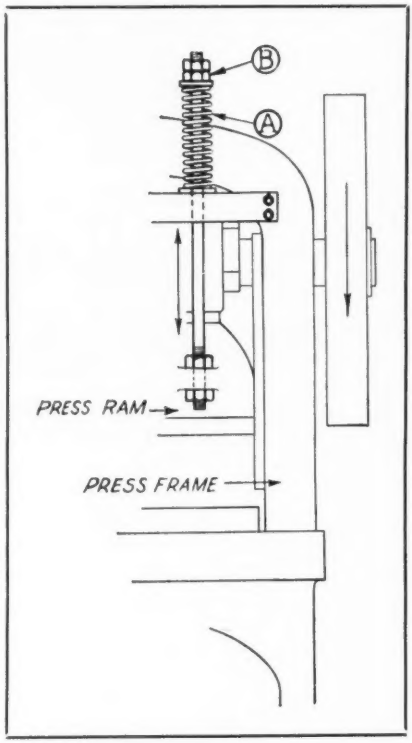

Fig. 3—Spring counterbalances are sometimes standard equipment on certain size presses.

lowered, it is usually necessary to change the spring tension by adjusting the nuts **B** so that there is no prohibitive spring tension at the bottom of the press stroke. These are not the most satisfactory counterbalances for long stroke or deep drawing presses.

Rubber ram checks (Fig. 4), as they are commonly referred to, are not as

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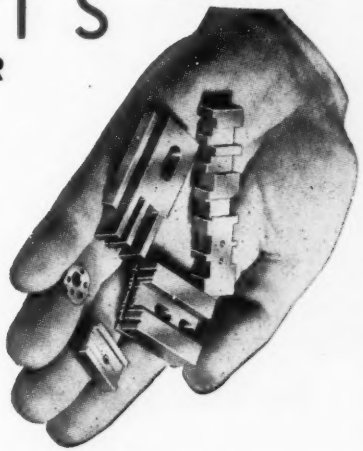

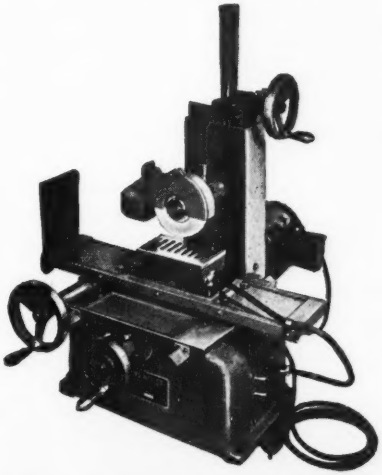

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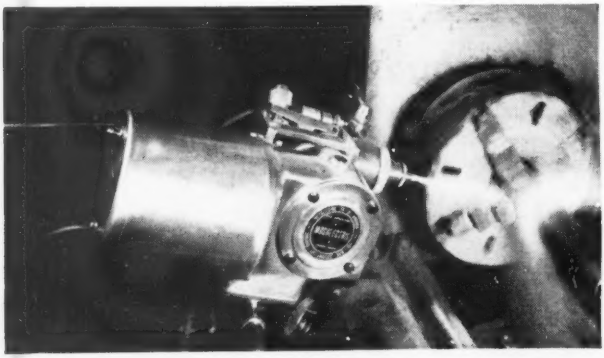
practical for the ram counterbalance as their effectiveness can only be used at the bottom of the press stroke, since too much pressure is built up when engagement occurs at the beginning of the stroke. The rubber bumpers, **A**, can be provided in sizes from 3 to 10 inches in various lengths. The piston section, **C**, is screwed on the ram connection and locked in place, and can be so adjusted that the dimension **B** can be the length of stroke of the press, with whatever rubber working tension necessary at the bottom of the press stroke. These rubber snubbers and rubber ram checks can be used only for limited applications; however, they can be used quite satisfactorily in checking the ram for severe blanking operations.

On blanking operations involving extremely heavy or high tensile materials, the overriding of the ram can be eliminated at the point of operation by the correct type of counterbalanced ram, so adjusted as to check the inertia at this period of the down cycle of the ram.

All connections for such counterbalancing should be made directly to the ram itself, such as shown in Figs. 2, 3, and 4. These "checks" can be applied to either straight side or inclinable presses in a satisfactory manner and, in the event pneumatic counterbalance cylinders are selected, the following three factors should be considered: (1) the approximate weight of the ram, (2) the stroke of the press, and (3) the



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adjustment of the ram. The size of the cylinder selected should be such as to compensate for these three conditions.

In selecting pneumatic equipment, the counterbalance cylinder should

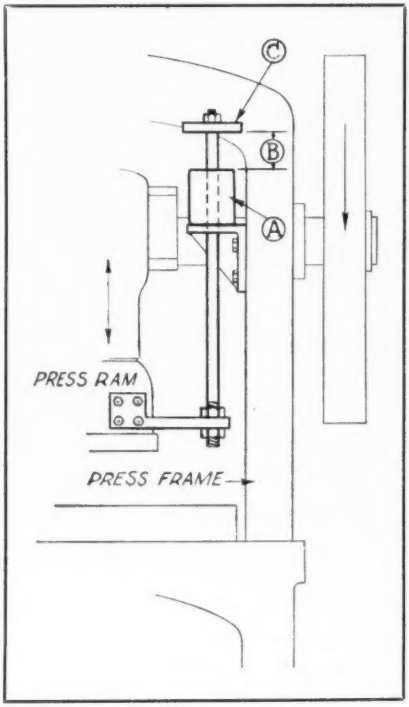

Fig. 4—Rubber arm checks are effective only at the bottom of the press stroke.

have a holding capacity equal to twice the weight of the press ram and a stroke equal to the press, plus the ram adjustment. For example, should the press have a stroke of 7 inches and ram adjustment of 3 inches, the approximate cylinder stroke should be 11 inches. Should the weight of the ram be 1,800 lb., the counterbalance cylinder should have a holding capa-

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city of 3,600 lb., or about 1.8 tons. In other words, the counterbalance cylinder should have a piston diameter of 5 inches and a maximum stroke of 11 inches and be provided with a surge tank and combination regulator and gage to maintain constant recorded holding pressure for checking the ram during its work cycle.

Both Sides of Turbine Bucket Ground Simultaneously with Newly Developed Grinder

A CROSS-SECTIONAL sketch of a typical jet aircraft turbine bucket of "pine tree" design is shown in Fig. 1. A recently developed automatic double wheel Truforming machine for simultaneously grinding the root section on both sides of the bucket is shown in Fig. 2. This machine is a product of the Thompson Grinder Co., Springfield, Ohio.

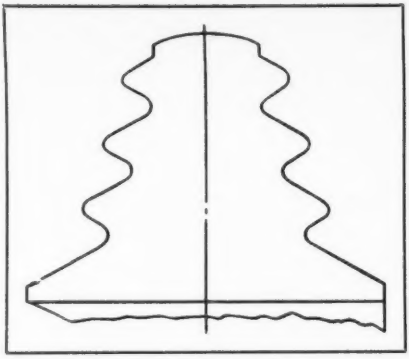

Fig. 1—Cross-sectional sketch of typical turbine bucket of "pine tree" design

The turbine bucket illustrated in Fig. 1 is approximately 2 inches long and requires 0.150 inch of stock removal per side from the rough to the

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finished size. With the grinder shown in Fig. 2, the part can be produced at a "day in" and "day out" rate of 30 buckets per hour. The production rate takes into consideration the down time for dressing, regrinding the crusher roll, initial machine warm-up period, wheel changing, and diamond changing. The actual production time of grinding one bucket is 110 seconds floor to floor. While the grinder is automatic in operation, the controls and adjustments are said to be so simple as to allow flexibility in the choice of method of production. To afford some idea of the operating sequence, two methods of production with the bucket shown in Fig. 1 are outlined in the following paragraphs.

By the first method in which two operations are required for grinding the bucket down from rough to finish size, the operator loads the work-holding block with piece therein into the machine and starts the machine cycle, which requires four seconds. The machine first grinds to within 0.005 inch of finish size with a total infeed of approximately 0.145 inch for each wheel head. The grinding cycle time is 84 seconds. The machine then comes to a stop, doors are opened, and the block is removed by the operator, this operation requiring two seconds, making a total of 90 seconds per block floor to floor.

At the second setting of the workpiece for finish grinding, the operator loads

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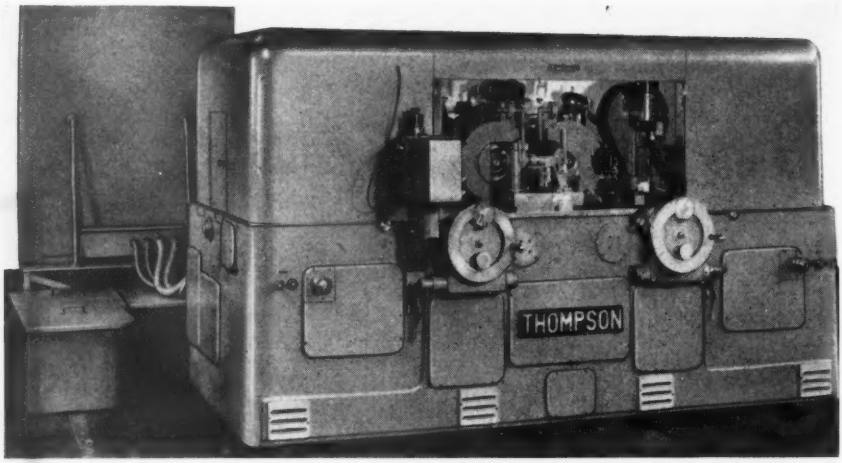

Fig. 2—Automatic double wheel grinder for simultaneously grinding root sections on both sides of a turbine bucket of the type shown in Fig. 1

as above, with four seconds required for this operation. The machining cycle in this case is 39 seconds and the unloading time is two seconds, making a total time of 45 seconds floor to floor per bucket for the finishing operation. The advantage of using this method of operation is better control of finish size. With this method, which is referred to as the "rough and finish" method, the operator crushes the wheel every five buckets, the crushing time required being 30 seconds. The crusher roll must be reground after every 10 crushings. The time required for regrinding the crusher roll is four minutes; thus, the roll is reground with this first method of operation after every 50 buckets.

Using the second method of operation in which the work is ground from rough to finished size in one machine setting, the operator loads the workpiece into the machine, this operation requiring four seconds. The machine cycle in this case is 104 seconds for the removal of approximately 0.150 inch of stock which is the total infeed of each

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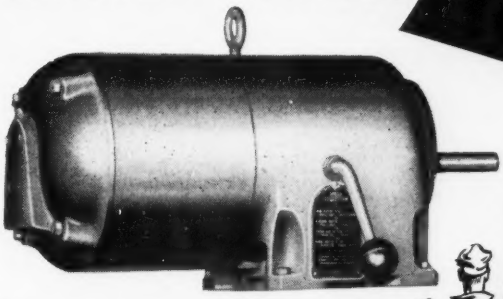

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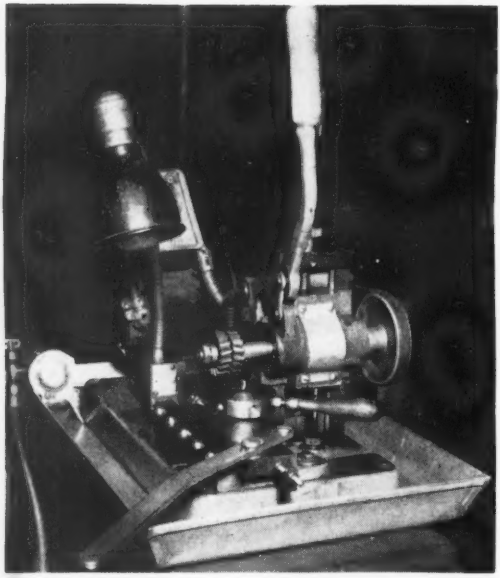

This illustration shows a hand miller setup for straddle milling small brass cylindrical pieces.

head. The unloading time it two seconds, thus making a total of 110 seconds floor to floor for the grinding of the rough part to finished size. In the second method of operation, it is necessary to crush the wheels after every three buckets; however, with the regrinding of the crusher roll after every 10 crushings, 30 buckets can be ground before the crusher roll must be reground. This method of operation has an advantage of faster production which, however, is very slight when the increased frequency of dressing and roll grinding is considered.

Straddle Milling Operation Performed on Cylindrical Pieces with Hand Miller

WITH the equipment shown in accompanying illustration, small brass cylindrical pieces are now being straddle milled at a rate of 600 per hour. The work is held in a collet holding fixture mounted on a sliding table and is moved under the two milling cutters which remain in a fixed position. This job is run continuously at regular intervals, and the machine is never knocked down nor reset after once being set up. The production rate with this equipment is said to be approximately one-third higher than with the equipment previously used. In some instances, the straddle milling operation has been performed on steel pieces, in which case coolant is directed over the cutters during operation.

The hand miller and accessory equipment are products of H. B. Rouse and Company, Chicago.

Oil-Hydraulic Presses Help Produce Metal Assemblies in Mass Volume at Shakespeare

USING specially tooled equipment skillfully integrated for various processing and assembling operations, the Shakespeare Co., Kalamazoo, Mich., mass produces an extensive line of levelwind fishing reels. In addition, the firm manufactures metal backs and clips for loose-leaf books. Wherever possible, the production of all of these items is on a progressive line basis, and most steps are handled by either auto-

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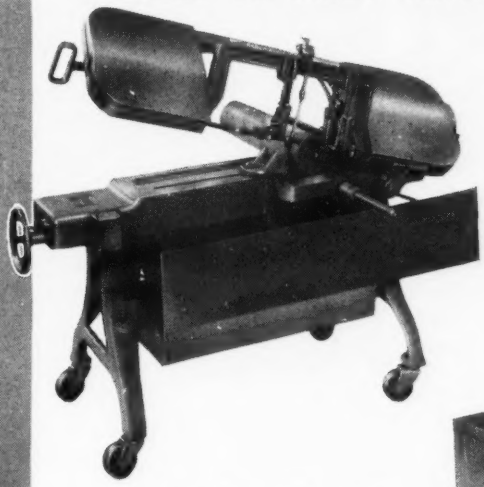

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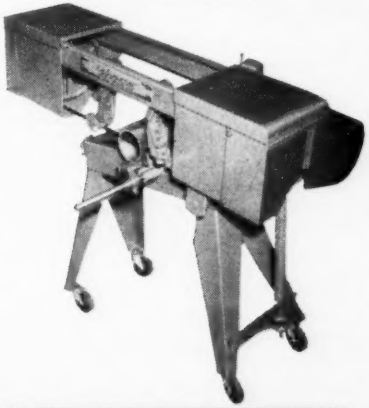

On the right, Kalamazoo Model 610-S—fast, rugged, and accurate, with a host of exclusive features for finer performance. Takes rounds, tubes, and pipe up to 6" diameter, bars and angles up to 6" x 10". Outstanding low-cost saw on the market. Uses any standard motor ⅓ HP, 110/60/1. Same capacity with coolant equipment as Model 610-C. Write today for complete information on any model.

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matic or semi-automatic methods. Equipment used on different operations for three of the metal assemblies includes specially tooled standard oil-hydraulic Multipresses made by The Denison Engineering Co., Columbus, Ohio.

One of the manufactured items is a levelwind guide assembly for fishing

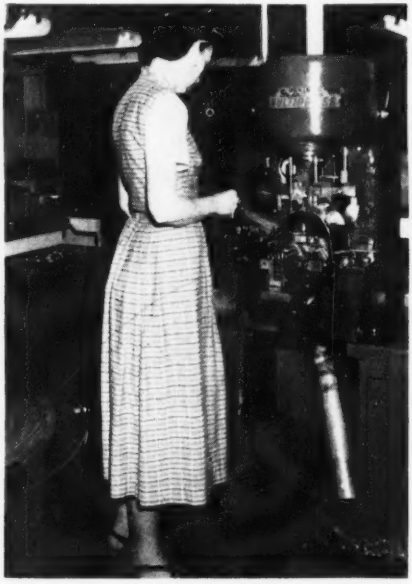

Fig. 1—Several integral steps are combined to produce a guide assembly for fishing reels with each complete automatic work cycle of this specially tooled oil-hydraulic press.

reels that enables anglers to bait cast without "thumbing the line." As shown in Fig. 1, an oil-hydraulic press processes and assembles this part in one complete work cycle involving a sequence of complex automatic actions. The press operator feeds stock to the die work area, and the assembly emerges from the machine as a hair-pin-shaped wire section mounted in a

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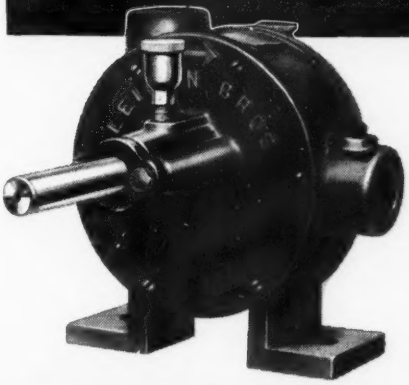

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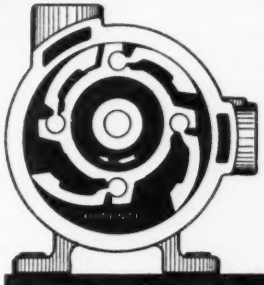

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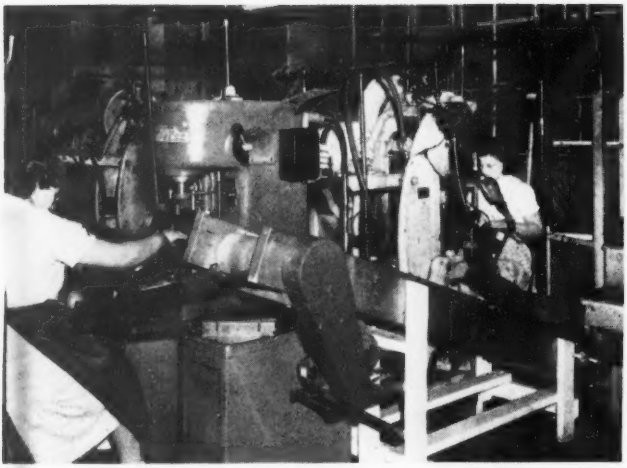

Fig. 2—Three components of metal backs and clips are assembled into single units for loose-leaf books on this oil-hydraulic press. An inclined belt conveyor carries the parts to the press operator.

block of metal. In each cycle of operation, the press automatically (1) straightens the coiled 0.057-inch diameter brass wire, (2) cuts it to proper length sections, (3) forms it into the shape of a hairpin, (4) inserts ends of the wire into holes in the block of metal, (5) stakes the shaped wire into position, and (6) bends the wire to the finished shape. The rate of production is 1,310 units per hour.

In another assembly job on the fishing reels, a Multipress is part of a production line turning out spool assemblies. This oil-hydraulic press is stationed at the beginning of the line. Specially tooled, it simultaneously stakes two spool flanges to a spool shaft. The production from this and subsequent operations is at an average rate of 550 completed units per hour.

In the Binder Division of the Shakespeare plant, an oil-hydraulic press is used in the final assembly of metal backs and clips for loose-leaf books at the rate of 1,300 per hour, as shown in Fig. 2. Prior to this mechanization, production was about 170 parts per hour. Other machines first process components of the assembly, forming wire rings and staking these in position in back strips that are blanked and formed from coil stock. The three components are then carried by an inclined belt conveyor to the oil-hydraulic press to be assembled into one complete unit.

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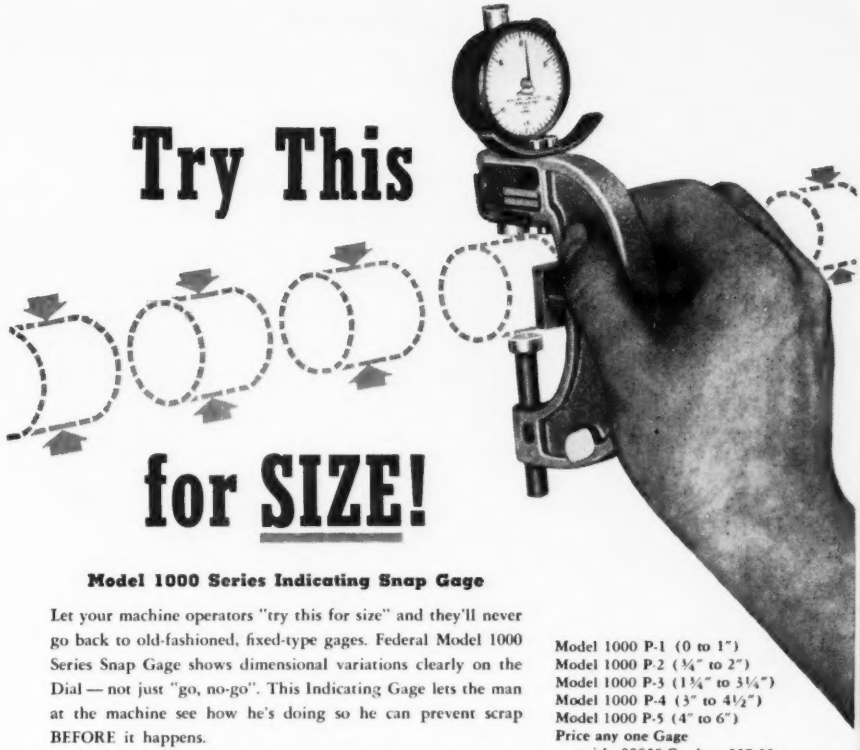

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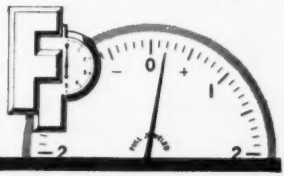

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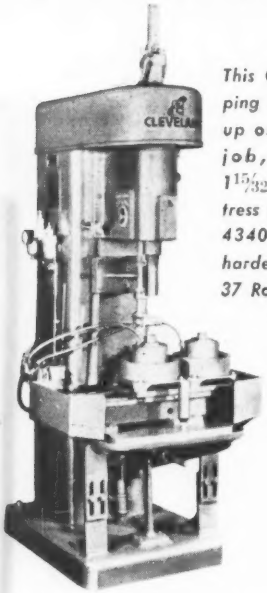


This Cleveland Tapping Machine is set up on a munitions job, tapping a $1\frac{15}{32}$", 16-pitch Buttress thread in SAE 4340 steel tubing hardened to 35 to 37 Rockwell.

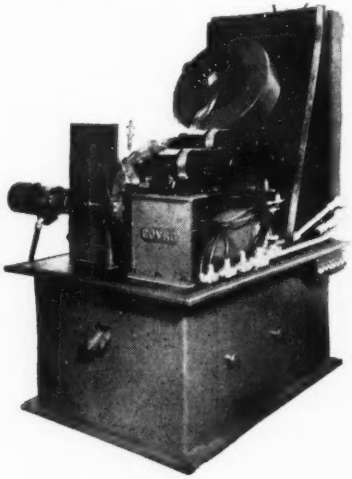
On Tapping, Threading, Drilling, Spotfacing, Reaming, and Chamfering operations, the chances are that CLEVELAND engineers can save you money and valuable working time by designing a CLEVELAND Tapping Machine which will not only combine several operations but also tap groups of holes at one stroke of the machine. *Check with CLEVELAND first.*

If you would like recommendations on a machine, submit prints, specifications, and sample parts. Write for your copy of the CLEVELAND Production Tapping Guide No. W-5.

THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
CANTON 6, OHIO

Cotter Pin Holes Automatically Drilled and Countersunk at Fast Rate

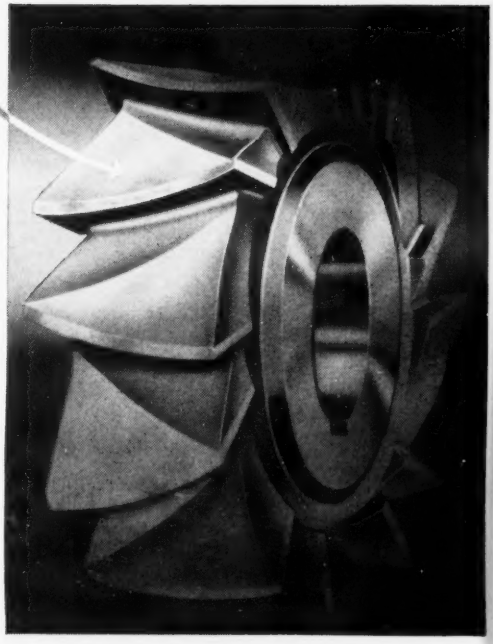
FOR quickly drilling and countersinking cotter pin holes in clevis pins and screws, a certain manufacturer makes use of a fully automatic machine of the type shown herewith, developed by the Govro-Nelson Company. Designed to perform the



Fast setup for automatically drilling and countersinking cotter pin holes

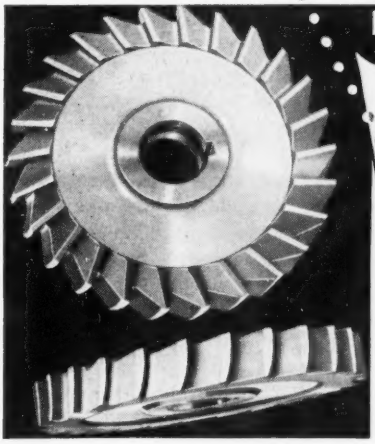
operations of drilling the hole and countersinking both ends at the rate of 1,500 pieces per hour, the machine is fully automatic, employing four automatic drilling units which operate simultaneously in conjunction with and are completely interlocked with an eight-station indexing dial and a hopper part-feeding mechanism. The part is first countersunk on one side by one drilling unit. Two units then perform the drilling operation in two stations, thereby reducing the drilling time per piece. The part is then coun-

150 to 425



YES . . . in a recent comparative performance test, 150 Aber "Curved Tooth" milling cutters *out-performed* 425 conventional type milling cutters — a 2½ to 1 increase at NO EXTRA COST!

Designed and developed specifically for production men who look to NEW tool designs to reduce top-heavy metal cutting costs, Aber "Curved Tooth" milling cutters operate at speeds 10% to 25% faster than standard straight tooth milling cutters in addition to providing smoother finishes and close to tolerance operations. Utilizing the most outstanding tooth design developed in the past decade, Aber Engineering Company produces a complete line of quality milling cutters featuring the "Curved Tooth" principle.



A TYPICAL ABER "CURVED TOOTH" PERFORMANCE

OPERATION: Milling lugs on plate. Slotting and side milling parallel sides.

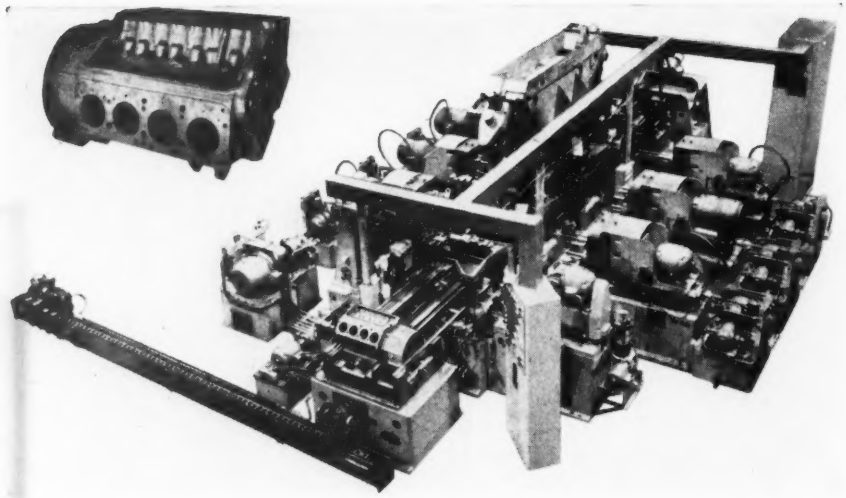
MACHINE: Cincinnati 3-Spindle Mill.

TOOL SETUP: (1) R. H. and L. H. Shear Side Milling Cutter.
(1) R. H. Half Side Milling Cutter.
(1) L. H. Half Side Milling Cutter.
Feed: 10-1 2"

PERFORMANCE: 16-1 2 hours between grinds. Best previous practice with conventional, straight tooth H. S. S. milling cutters was 6-1 2 hours between grinds.

ABER

ENGINEERING WORKS INC.
WATERFORD, WISCONSIN



Eight-cylinder V-type automotive cylinder blocks are each drilled with 83 holes at the rate of 52 blocks per hour at 100 per cent efficiency with this special 7-station transfer machine.

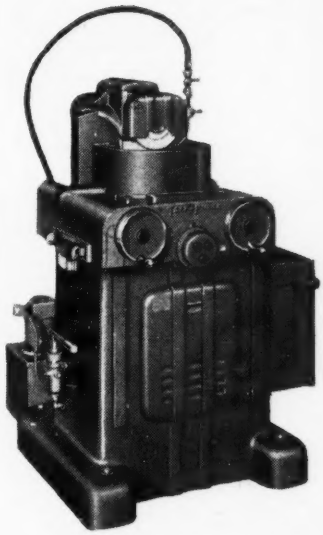
tersunk on the other side by the fourth drilling unit.

The machine is designed to stop automatically should a tool break or should a malformed part jam in the mechanism. Moreover, it is arranged to slow down automatically in case a tool becomes extremely dull. The indexing mechanism cannot operate unless all of the tools are out of the work. Similarly, the drilling units cannot operate during the indexing.

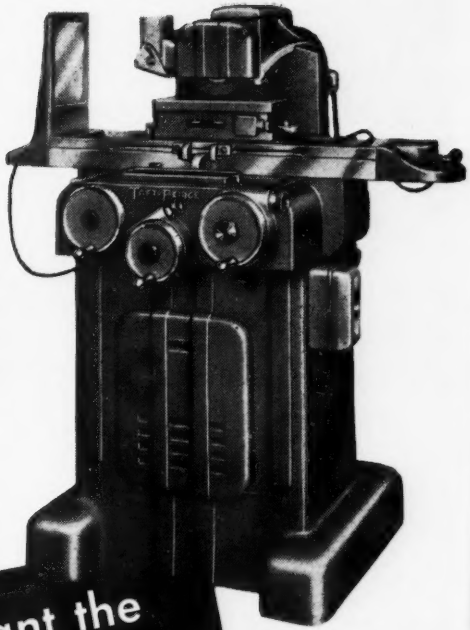
Special Transfer Machine Performs 83 Drilling Operations on Automotive Cylinder Block

FOR the Chrysler Corp., Detroit, Mich., the Barnes Drill Co., Rockford, Ill., has completed and installed the special 7-station transfer machine shown herewith which is designed to drill holes in both ends and angular holes in both banks of 8-cylinder V-type automotive cylinder blocks. A total of 83 holes is drilled in each block, and the production rate is said to be 52 blocks per hour at 100 per cent efficiency.

The machine consists of 14 hydraulically and air-operated units with auxiliary heads; a conveyor system; automatic lubricating system; chip conveyor system; and 7-station transfer mechanism with fixtures for holding parts while at the various stations. The machine can be operated by one man at the central control station and is arranged so that production can continue without any one of the individual units. It is also possible to operate the machine with the workpiece delivered to any one of the stations for a single operation. This arrangement has been found very effective in reducing production loss from breakdown, tool changes, and servicing.



The Taft-Peirce 6" Rotary Grinder with .0001" vernier for super-precise rotary grinding.



The Taft-Peirce No. 1 Precision Surface Grinder with .0001 vertical and cross feed verniers for the highest degree of accuracy, flatness, and finish on plane surfaces.

When you want the *Ultimate in Accuracy* try this trio

The Taft-Peirce 24" Lapping Machine for that last critical element of precision super-finish on plane or cylindrical surfaces.

The accumulated skill of the world's most experienced tool and gage makers has gone into these three machines . . . all originally developed *for our own gage production.* Each has been designed and built with the ultimate care to give the ultimate in accuracy, flatness, and finish. If accuracy is *your* problem . . . let us tell you about the unusual features of these machines.

THE TAFT-PEIRCE MANUFACTURING COMPANY
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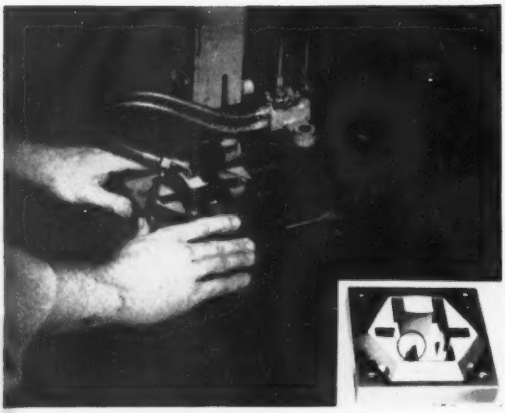
T-P *means* Top Precision



With the aid of a unique abrasive band tool operator repairs broken hardened steel die shown in the inset.

Broken Die Repaired with Unique Abrasive Band Tool

THE accompanying illustration shows an interesting application of the Line Grind Band recently introduced by The DoAll Co., Des Plaines, Ill. The band tool, which consists of a tough alloy band on which cubical molded abrasive matrices are welded, is shown in operation on a DoAll Contour-matic machine (for which it is exclusively designed) which has made possible the repair of a broken die by "cutting" out the damaged section. The band is said to have required only six minutes to remove the square inch of Ketos steel hardened to 59 Rockwell C. In the cutting action of the band, there is an equalized balance between bonding and abrasive grits which provides for a constant degree of abrasive exposure.

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Parts feed automatically toward front—end reaching and fumbling. Bins taper toward front to form convenient semicircle—keep all bins within easy reach. Stacking, locking construction for rigid setups, easily changed when necessary. All-welded construction. Smooth, folded edges. New-design, adjustable hoppers provide increased capacity and permit regulated flow of parts according to sizes and weights. Two-sizes—tapered or straight sides.

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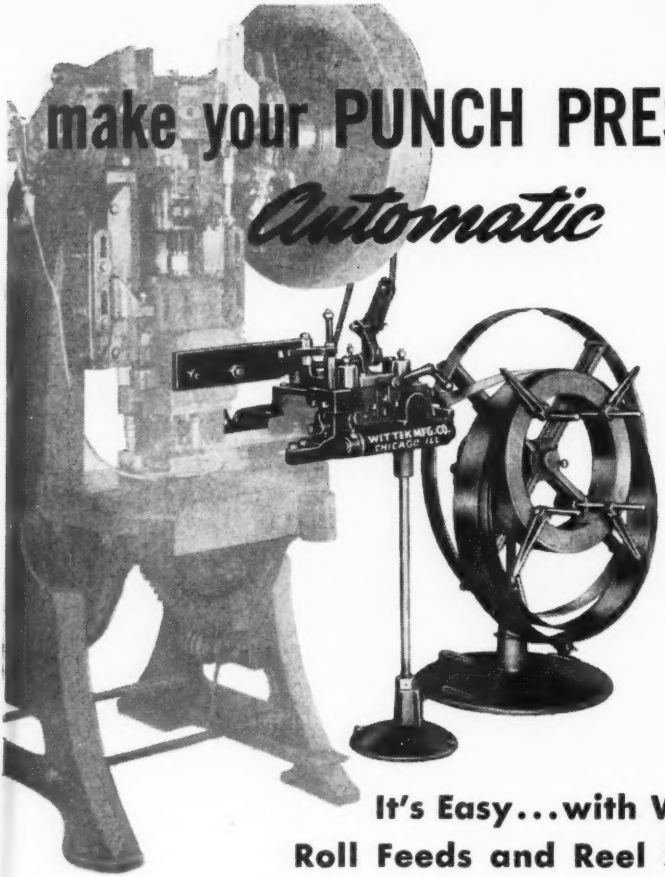

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Wittek Reel Stands facilitate handling coiled stock.

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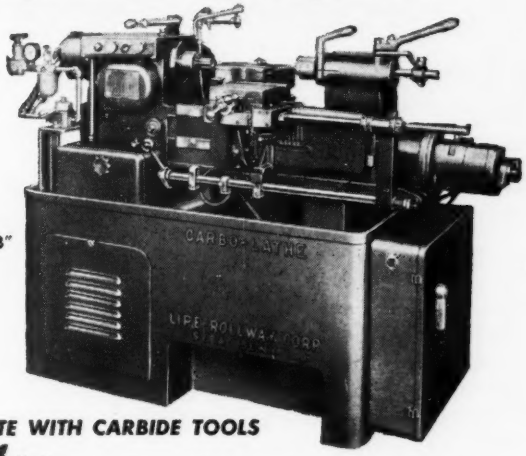

Swing over bed—12"
Swing over cross slide—7"
Distance between centers—18"
Floor Space—31" x 51"
10 H.P. Motor
Feeds—.003" to .030"

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with complete cycle electrically controlled

Bed and headstock cast in one piece from 500 pounds of chrome-molybdenum-iron! Massive tailstock with a 3" diameter quill! Heavy bed sidewalls reinforced by cross ribs! These are the reasons why the Lipe Carbo-Lathe eliminates all deflection and weaving—why it is rigidly resistant to torsional stresses and strains.

Brute power and a wide range of selective speeds permit hogging feeds and cuts on high-Brinell steels, scaly surfaces, weld spots and jump cuts. Designed for carbide tools, this lathe insures faster, more accurate work.

More, the complete cycle can be electrically controlled. A push on the starter button starts the spindle, moves the carriage to the cutting position, automatically engages the mechanical feed. At the end of the cut, the feed disengages, the spindle stops and the carriage returns quickly to the loading position. At every point in the cycle the operator has complete manual control.

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Lipe automatic cycle attachment may be applied to any Lipe Carbo-Lathe bearing a serial number of 200 or greater. See your Lipe distributor for full details.

Lipe Carbo-Lathes are sold with or without Automatic Cycle Attachment. Write for further information and delivery dates.

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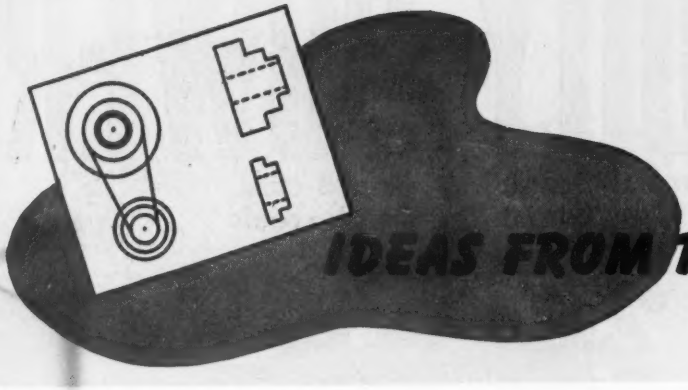


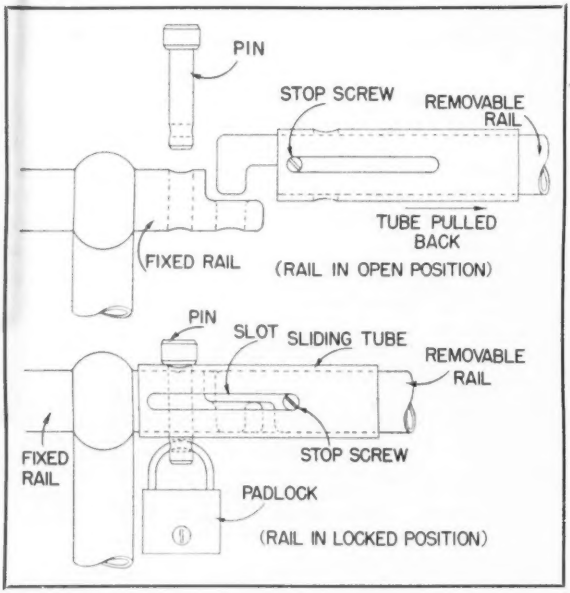
IDEAS FROM READERS

Sliding Tube Locking Device for Guard Rail

By F. E. Riley
England

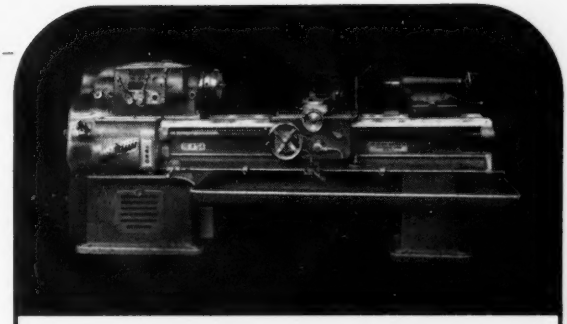
SOME types of tubular steel railings have detachable sections fitted with simple hooks at each end so that the sections can be removed quickly to allow heavy materials and equipment to be passed through the railing. A removable section of this type was incorporated in a railing protecting a low-level floor between two areas of a machine shop. It was discovered that the section could be accidentally unhooked by a person leaning over it and, after an employee had suffered a serious fall into the lower section of the machine shop, the management decided that some positive locking device should be fitted to the removable rail section.

The sliding tube device shown in the accompanying sketch was finally adopted and has proved very successful in avoiding further accidents. A length of steel tube is arranged to slide on the outside diameter of the rail in such a manner that it completely encases the detachable and fixed



Sketch showing sliding tube locking device for guard rail in open and closed positions

Standard Model—



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Alloy Steel Gears in Headstock.
Gears Refinished After Heat Treatment.
Gear Shafts Mounted in Anti-Friction Bearings.
Anti-Friction Spindle Bearings Double Opposed, Pre-loaded.
Spindle End Indexed for Multiple Thread Cutting Without Disturbing Gear Train.
Apron and Carriage, Automatically Lubricated.
Quick Acting Levers Operate Longitudinal and Cross Feeds.
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Spindle Nose Optional; Flanged Type Cam Locking, Long-taper Type Key Driven, Hendey Standard Threaded Nose.
Lathe Equipped with the New High Speed Apron Reverse for Lead Screw.
New Feed Dials, Large, Accurate and Quick Reading.
Micrometer Carriage Stop; Automatic Longitudinal Stops in Either Direction of Travel.
New Positive Cross Slide Stop.
New Re-inforced Bed Brackets with Anti-friction Bearing for Tail End of Lead Screw.
Special Clamping Device for Tailstock.

Every feature necessary for precision turning at modern production speeds is incorporated in the 16-inch, 18-speed Hendey engine lathe — in other words, *Built to Hendey's Modern Precision Standards.* The operator will find every convenience — from easy-operating controls to features that practically eliminate maintenance. Induction hardened and precision ground bed ways provide life-long precision for both carriage and tailstock. This modern Hendey Tool Room Lathe is available in standard and tool room models. The latter is shown below with sub-headstock for producing threads with long leads. *Write for catalog.*

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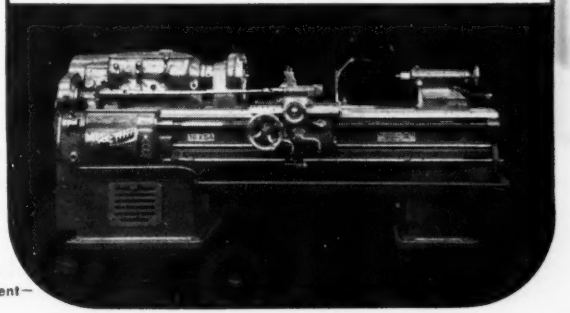

Tool Room Model with sub-headstock & relieving attachment—

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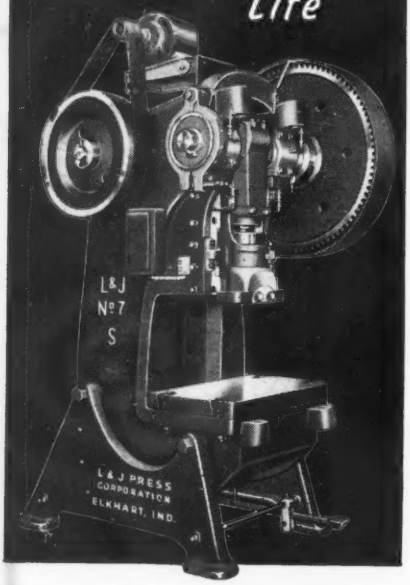
for Longer Die Life



Exceptionally rigid frames; extra long gibs and large bearing areas, accurately machined, prolong die life. The actual deflection of every L&J design is measured under load. This is only one of the features that contribute to economical and dependable production.

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L&J PRESS CORP.

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portions of the hook joint. A hole is drilled through both the sliding tube and the fixed portion of the hook joint to accommodate a headed pin which has a cross drilled hole at the lower end to receive a padlock. To prevent the sliding tube from becoming detached from the removable rail, a stop screw is provided which engages with an elongated slot cut into the wall of the sliding tube. The slot and stop screw also ensure that the holes for the headed pin are in proper alignment at all times.

The removable rail section can be unlocked only by a foreman or other responsible person holding a key. With this arrangement, there is assurance that the gap in the rail is used only when essential and that work being performed can be watched over by more than one person. Two detachable sections are fitted in the particular railing under discussion, each section being equipped with a sliding tube lock.

Combination Jig and Fixture for an Intake Pipe

By Robert Mawson

IN the design of special equipment such as jigs and fixtures, one of the factors to be considered is the number of parts for which the equipment is to be used. If the number of parts to be processed is small, the equipment designed may often be relatively inexpensive in comparison to the cost of equipment for larger-quantity jobs. However, in all cases, accuracy of the jigs and fixtures is all-important; and the parts processed in the jigs and/or fixtures should be interchangeable with other similar parts.

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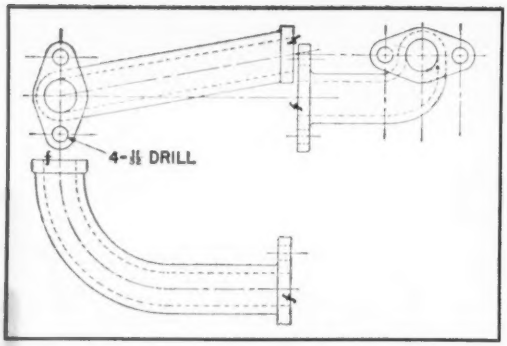

Fig. 1—Sketch of a bronze intake pipe

The illustration, Fig. 1, shows a sketch of an intake pipe which is made from a bronze casting; it is a part which is used by the Red Wing Motor Co., Red Wing, Minnesota, in the building of "Thorobred" marine engines. The intake pipes are produced in limited quantities as ordered, and so the design of special jigs and fixtures is governed accordingly. One of the special pieces of equipment which has been designed for the intake pipes is a combination milling fixture and drill jig which is used for milling the outside surfaces of the two flanges and for drilling two 11/32-inch holes in each flange; a drawing of this combination tool with an intake pipe shown in position may be seen in Fig. 2.

The combination jig and fixture is made with a cast iron main section which has two adjacent sides, **A** and **B**, rising from a base, **C**. Those surfaces which are finished are marked **f**. Holes **D** are provided in side **B** and in base **C**

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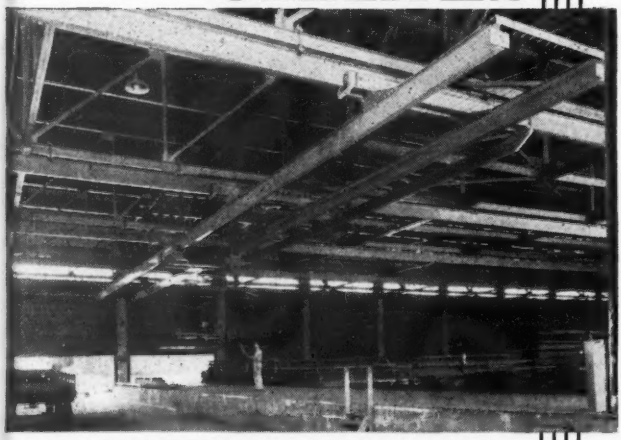
for locating the device on machine tables. Four projections, **E, F, G,** and **H** are provided on side **A** in order to accommodate various work positioning members. Projection **E** is a small pad on which is fastened, by means of a set screw and two dowel pins, a special machine steel, cyanized and hardened V-block, **I.**

The other three projections, **F, G,** and **H,** are machined on their free ends and on one of their sides to angles of 11 deg. 22 min. in order to match the angle of the intake pipe axis. Two positioning studs, **J,** are provided in projection **F,** and these studs are held in place by means of nuts **K.** Similarly, two studs, **L,** which are held in place by nuts **M,** are provided in projection **G.** Projection **H** holds two positioning members; a square head set screw, **N,** is provided through the central portion of the projection, and swinging steel clamp **O,** is provided at the end of the projection. The clamp is allowed to pivot on a hex head set screw, **P,** and a square head set screw, **Q,** is positioned in the free end of the clamp.

Another steel clamp, **R,** is provided parallel to side **A.** Clamp **R** is positioned on the end of a stud, **S,** and it is held in place by means of a nut, **T.** Located at one end of clamp **R** is a long cap screw, **U,** which is maintained in position by means of two nuts, **V.** This cap screw acts as a spacer between the inner surfaces of clamp **R** and side **A.**

Two rectangular drill guide plates, **W** are

Industrial CRANES



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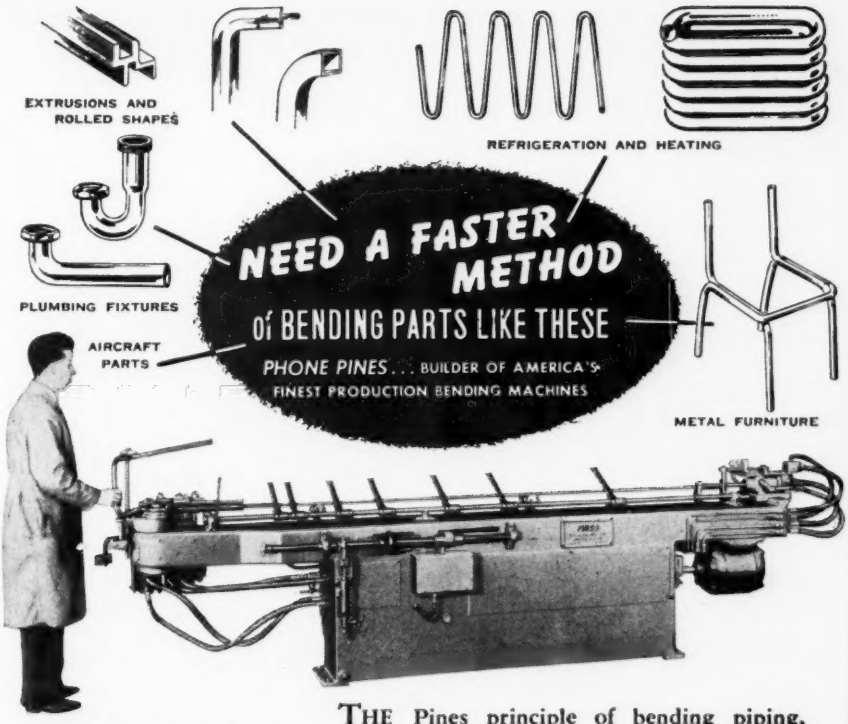

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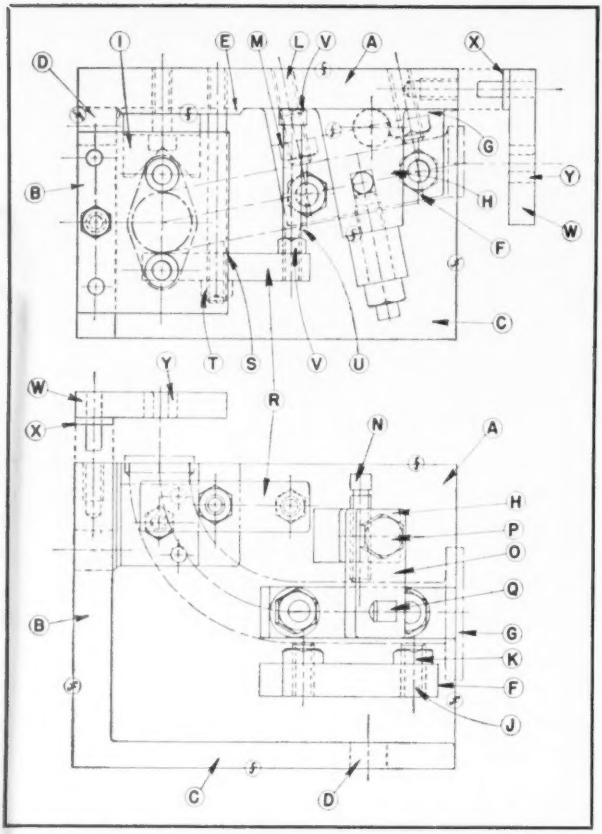

Fig. 2—Combination milling fixture and drill jig. An intake pipe is shown in phantom.

made for the tool. A ⅛-inch spacer washer, **X**, is attached to the under surface of each plate, and two tool steel, hardened and ground guide bushings, **Y**, are accurately positioned in each plate. The plates, which are removed for the milling operations, are held in place by means of two dowel pins and a set screw.

In use, the two intake pipe flange surfaces are milled first. The base, **C**, is fastened to a milling machine table, and then a workpiece to be machined is placed in the holding device. Visualizing the unit, the upper curved surface of the intake pipe is positioned against V-block **I**, the lower surface is rested on studs **J**, and the inner surface is positioned against studs **L**. Clamp **O** is rotated perpendic-

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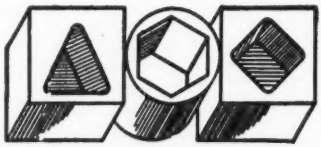

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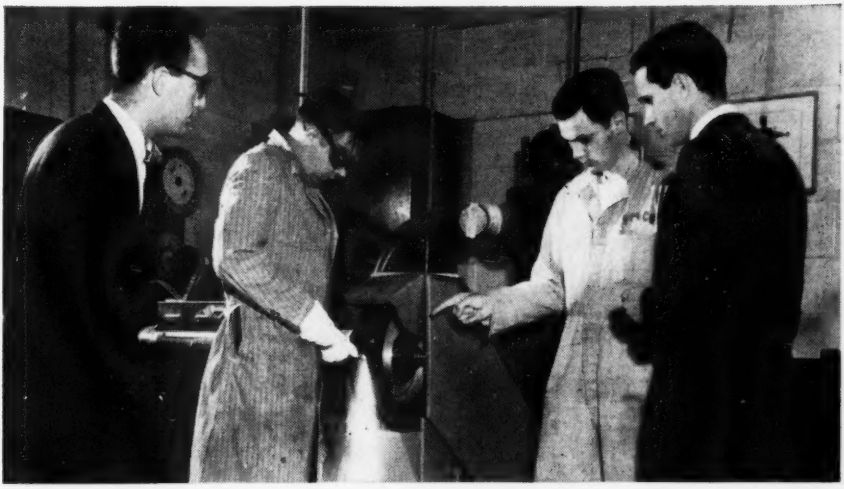

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ular to the work, and set screw **Q** is tightened onto the work. Nut **T** is tightened to position clamp **R** on the work, and set screw **N** is also tightened to position the intake pipe positively against studs **J**.

A .125 inch spacer gauge is next placed on the upper surface of side **A**, and the correct machining position for the milling cutter is obtained. This positioning is accomplished by adjusting the machine table which carries the holding device until the face of the cutter contacts the spacer. The machine is then started, and the outer face of the flange is milled.

The clamps holding the device in place are then removed; the device is turned so that side **B** is rested on the machine table; and then the unit is again fastened securely. A similar procedure is followed for positioning the milling cutter with respect to the spacer gauge, and the face of the second flange is milled.

The clamps are removed again, and the unit is transferred to a drill press. Base **C** is clamped to the drill press table, and one of the guide plates, **W**, is fastened to the top of side **A**. The two holes in the first flange are then drilled, the drills being guided through the drill bushings in the conventional manner. Guide plate **W** and the clamps are then removed; the unit is turned so that it rests on side **B**; and a similar procedure is followed for drilling the holes in the second flange.

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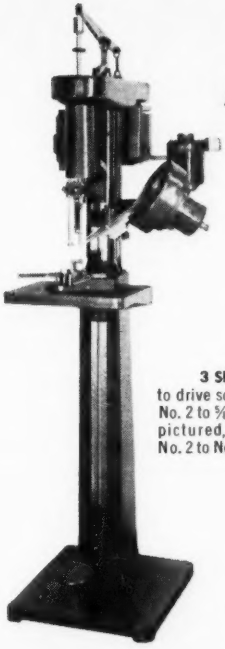

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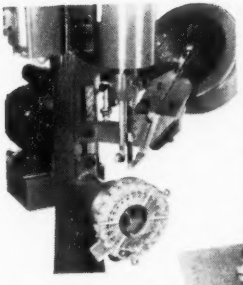
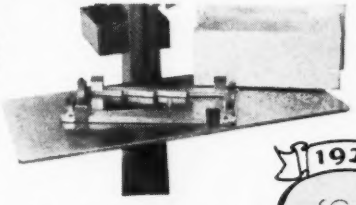


Vertical type, manually operated fixture assembling screws around outer periphery of cylindrical die casting.



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have been completed, set screw **N** is unscrewed, set screw **Q** is unscrewed, clamp **R** is loosened by unscrewing nut **T**, and the work is removed.

The procedure followed for machining this intake pipe is no doubt different from that which would be followed in plants where large quantities of items are produced. However, the method used may be considered to be good practice for a shop in which only a limited quantity of parts are machined in an order lot. The workpieces produced are interchangeable with other similar parts. The feature of combining a milling fixture with a drill jig is well worth noting since the time required for positioning and removing a workpiece may be reduced by using one holding device instead of two.

Method for Checking Spindle Relationship of Vertical Attachment to Work Table

By Fritz L. Keller

IN recent years, the use of vertical drilling and milling attachments has become quite commonplace, and the methods employed in setting and checking the spindle relationship of these attachments with regard to work tables vary with machinists. The practice of using marks or even a square for this purpose has often failed to provide satisfactory results. If the spindle in the vertical attachment is not set absolutely vertical to the table, a variation in diameter of holes drilled or bored may be the result. Such a variation is particularly noticed when a short drill is used first in the attachment followed by a long drill or reamer.

The accompanying sketch shows an

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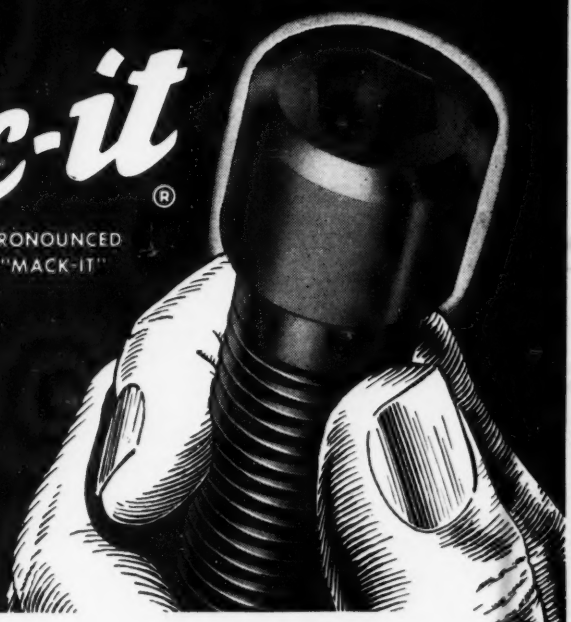

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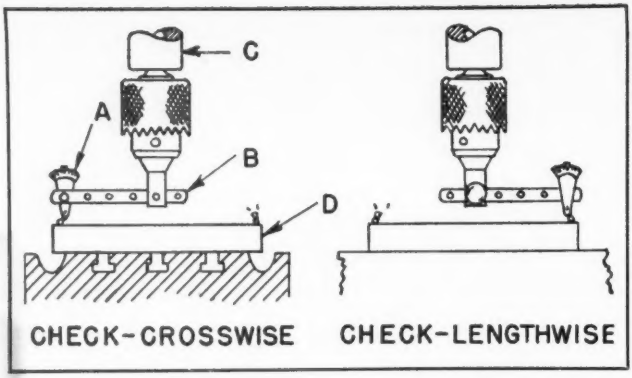

Sketch showing method of checking spindle relationship of vertical attachment to work table

effective method devised by the writer for accurately checking spindle relationship of vertical attachments to work tables. The method involves the use of an indicator, **A**, attached to one end of a long extension, **B**, the other end of which is fastened to the vertical attachment, **C**. By swinging the indicator from one side of the work table to the other, the operator can readily see how much the spindle is out of alignment and in what direction. Adjustments can then be made until satisfactory for the work at hand. A parallel, **D**, has been found of great assistance in checking the vertical relationship of spindle to work table since it provides for an average check over the surface of the table and minimizes difficulties in approaching T-slots with the indicator. To effect an

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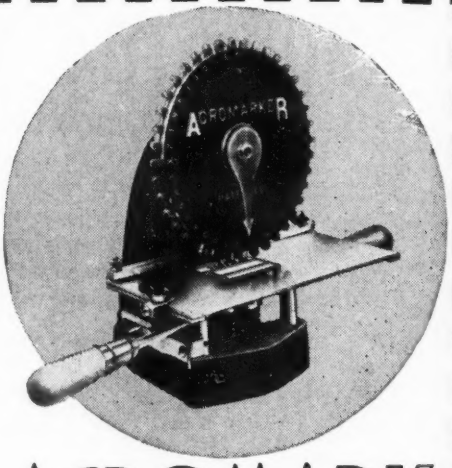

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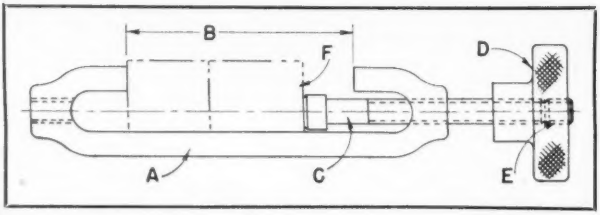

Sketch of a handy clamp for small work and hard-to-reach spots

accurate check, spindle and table relationship must be checked crosswise and lengthwise, as shown in the sketch.

Handy C-Clamp Made from Turnbuckle

By Irwin Mansfield

A VERSATILE C-clamp, which may be used for small work and in restricted areas where regular clamps would be too difficult to use, may be made from a standard turnbuckle. The turnbuckle-clamp is relatively simple and inexpensive to make.

As shown in the accompanying sketch, a section on one side of the turnbuckle, **A**, is cut off, as indicated at **B**; this cut-off section serves as the open part of the C-clamp. A long standard socket head cap screw, **C**, is then threaded into the end of the turnbuckle which contains the right-hand threads. A handknob, **D**, which is tapped in the center is screwed onto the end of the cap screw, and a short headless set screw, **E**, is used to hold the knob securely in place. The method of clamping a workpiece may be seen at **F**.

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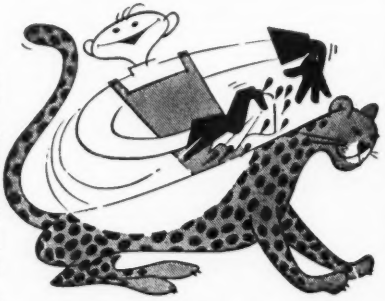

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An Economical Forming Fixture

By J. P. Essex
England

AN order for 5,000 finger rings of the type shown in Fig. 1 was placed with an English contract firm These rings were to be riveted in the handles of orange nippers used by native workers in South Africa for removing fruit from trees. The purpose of the ring in each case was to enable a cord to be fastened there-

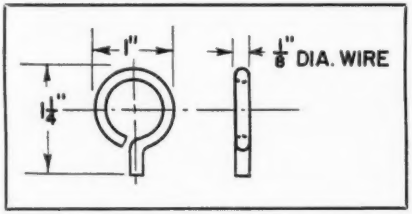

Fig. 1—Sketch of finger ring for orange nippers

from to the worker's buttonhole so that in the event the user, while on a ladder, dropped his nippers, he would not have to descend the ladder in order to retrieve the tool.

The rings were made from ⅛-inch diameter Swedish iron wire which is very ductile and, when formed, has very little spring-back. For producing the rings, the writer devised the fixture illustrated in Fig. 2 which was designed for use in a hand press. Economical to make, the fixture performed its allotted task very satisfactorily and afforded a production of approximately 300 pieces per hour.

Part **A** shown in Fig. 2 is a plain bushing with 1-inch bore which was fastened to bolster plate **B** by three countersunk screws. Punch **E** was fitted into bushing **A**, the end of the

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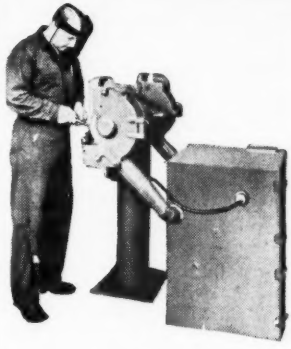

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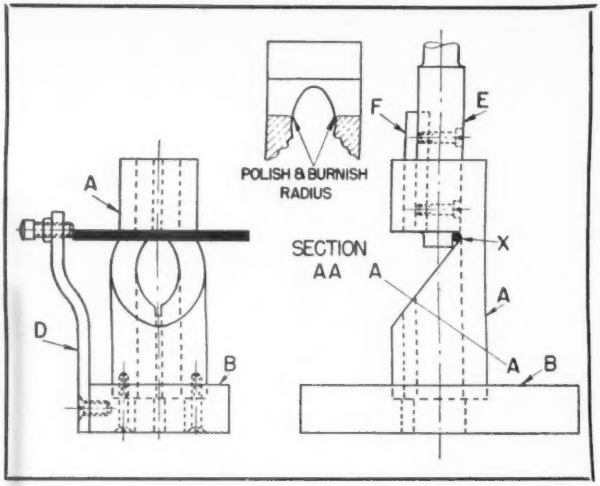

Fig. 2—Sketch of fixture for producing finger ring shown in Fig. 1

punch being necked down to a ¾-inch diameter so that when the punch was in the position shown, it left an aperture for the insertion of the wire, as indicated at **X.** The edges of the angular face (around the hole) of bushing **A** were well rounded and burnished before hardening, and the ball-like surface was was then polished. Part **D** is an adjustable stop which was set to provide a close joint where the wire meets. Key **F** inserted in the punch **E** served to back up the tang on the workpiece as it passed through the die.

In using the fixture, the wire, after being cut to the proper length, was inserted between the punch and die, as shown at **X.** The descending punch then caused the wire to wrap around the neck portion and, after about eight pieces had passed through the die, one ring dropped into a box at every stroke of the press.

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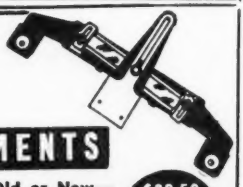

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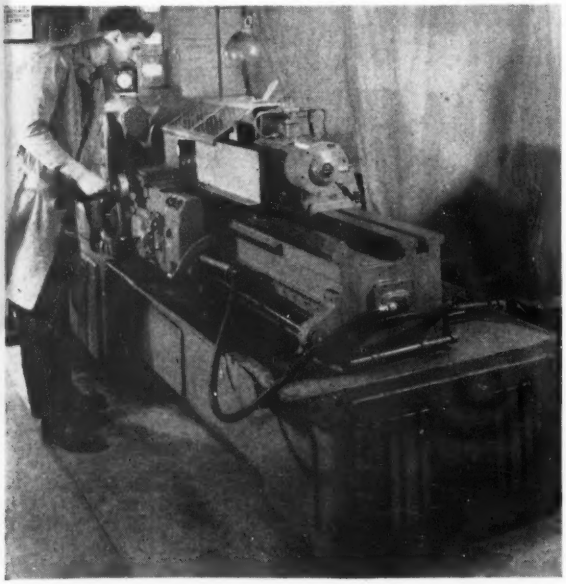
News of the Industry

Monarch Develops Specially Equipped Lathe for Research Program Conducted by Curtiss-Wright

The specially equipped lathe shown in the accompanying illustration was developed by The Monarch Machine Tool Co., Sidney, Ohio, to facilitate the study of metal-cutting problems in a research program conducted by Curtiss-Wright Corporation under contract from the United States Air Force. Other participants in the project which was designed to improve the machinability of various metals, particularly the new high temperature alloys, were the Ford Motor Company, Massachusetts Institute of Technology, and Metcut Research Associates of Cincinnati.

The Monarch lathe shown simplified the selection of the wide variety of speeds and feeds required in making the tests. Basically a 13 x 42-inch Mona-Matic machine, its normal spindle speed range of 130 to 3,000 r.p.m. was stepped up to 6,000 r.p.m. maximum through special gearing and the use of a 20 h.p. variable speed drive. The several tachometers used in selecting and maintaining the exact surface speed required for a given test are mounted on top of the lathe headstock. A mechanical two-component dynamometer attached to the cross slide measures both cutting and thrust forces created by the turning operation.

With this lathe, it was found that any machining operation, including composition and geometry of the tool, heat treatment and microstructures of the material, and feed and speed, no matter how complex, could be pretested



Specially equipped Monarch lathe used to facilitate the study of metal-cutting problems in a research program conducted by Curtiss-Wright Corporation under contract from the United States Air Force

and evaluated more quickly and economically than with the ordinary "cut-and-try" methods of full scale testing.

Curtiss-Wright has released a comprehensive report on this project which outlines the test procedures followed, gives definitions and details of the metal-cutting research conducted, and describes methods of carbide tool selection and evaluation of machine tools for greater productivity. New data are also supplied on the most efficient ways of machining high temperature alloys, as well as cast iron and steel, from the standpoint of their microstructures.

Crucible Official Receives Navy Service Award

The United States Navy has made its award for distinguished public service to A. E. Van Cleve, vice president of Crucible Steel Company of America, New York City. Francis P. Matthews, Secretary of the Navy, presented the award to Mr. Van Cleve with this citation: "Under his direction the Crucible Steel Company achieved the greatest volume of contracts for all companies producing projectiles, rocket heads and bombs for the United States Navy, and largest volume of large caliber armor-piercing and high capacity projectiles."

Mr. Van Cleve was in charge of Crucible's Atha Works, Harrison, N. J., the company's ordnance center during World War II. The Atha Works' force during the height of production for the armed forces in World War II was some 15,000 men and women. Mr. Van Cleve, who is a graduate of the Newark Technical School and the Cooper Institute, became manager of the Atha Works in 1917, after having held a number of other operating posts in the plant.

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IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
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(AC-50)
All collets in hexagon, square and round.
KLUTCH-KOLLET
Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.
Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!
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KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

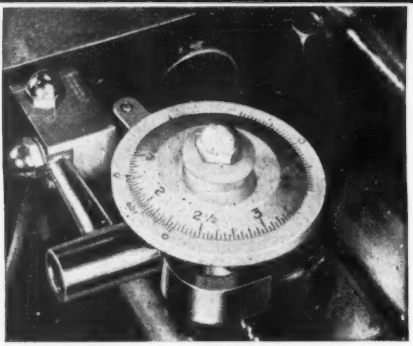
GENERAL DIE AND STAMPING CO.
Integrity Since 1919
264 MOTT STREET • NEW YORK 12, N. Y.

Company Formed to Make Air Filters

Formation of a jointly owned company to manufacture a unique air filter, first used by the Atomic Energy Commission to keep radioactive particles out of the atmosphere, has been announced by Arthur D. Little, Inc., Cambridge, Mass., and Carrier Corp., Syracuse, N. Y. The new company, known as Cambridge Corporation, is located at 350 South Geddes Street, Syracuse, New York. Raymond Stevens, vice president of Arthur D. Little, Incorporated, has been elected president of the corporation and David H. Northrup of Carrier Corporation vice president and general manager.

Initial production of the new filter is now under way, and it is reported that single filter units can be made to handle 1,000 cubic feet of air per minute at pressures within the capacities of central station air conditioning systems. The filter, it is claimed, will be particularly useful wherever air must be completely dust-free or sterile, as in the manufacture and assembly of precision devices. The filtering medium itself is a special soft felt-like paper containing sub-microscopic asbestos fibers which direct the air thru such tortuous paths that essentially all of the particles become entangled in the fibers. Large sheets of this paper are folded in accordion fashion and fitted into a frame, thereby providing a large filtering surface in a relatively small space.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



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MEASURING ATTACHMENT
for Lathes (Direct Reading) Saves Time • Reduces Waste

• This handy Weldon attachment measures directly the forward or reverse movement of the lathe carriage, within .001 of an inch. Easily attached to most lathes by drilling and tapping of one hole. • Dependable, accurate, convenient—saves time and reduces work spoilage.

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THE WELDON TOOL CO. Cleveland 4, Ohio
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New 15" heavy duty, production model drill presses with dozens of specially designed and engineered features — Before you buy —

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toolkraft CORPORATION
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Darra James POWER TOOLS

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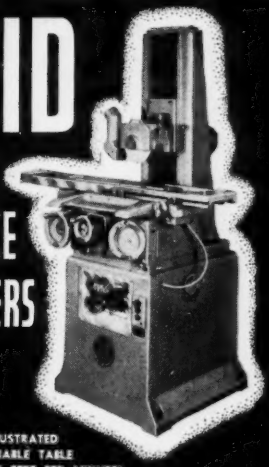

REID MODEL ILLUSTRATED
6 BY 18 WITH VARIABLE TABLE
SPEED (12 TO 35 FEET PER MINUTE)

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ESTABLISHED 1900 - BEVERLY, MASSACHUSETTS

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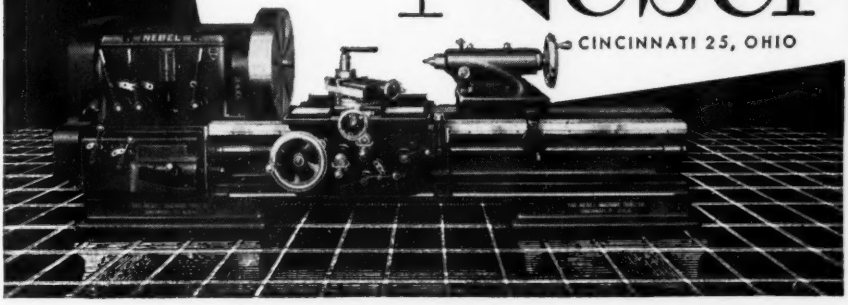

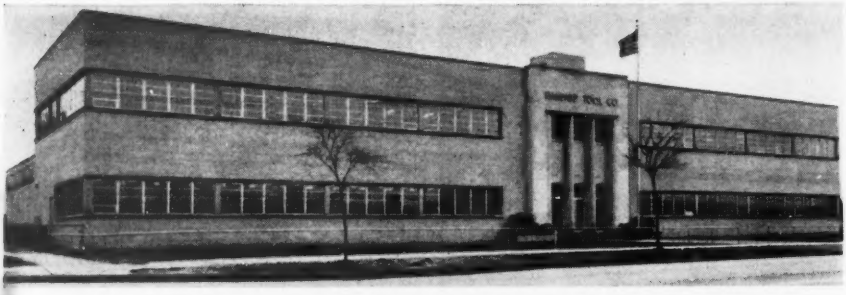

New office, warehouse, and experimental laboratory building of Standard Tool Co., Cleveland, Ohio

Standard Tool Company Moves to New Building

Standard Tool Co., Cleveland, Ohio, manufacturer of cutting tools, has moved into a new office, warehouse, and experimental laboratory building. The building was formally opened recently with an open-house reception for 300 industrialists and visiting mill supply and hardware distributors.

Standard Tool has 130 employees in Cleveland and 54 in its branch offices in New York, Chicago, Detroit, and San Francisco. The company employs 1,800 persons at its main plant in Rochester, Mich. Paul E. Lees is president and Philip Rackliffe is executive vice president of the company.

WHY DO IT THE HARD WAY?
CH4+(Fe1C)nQ
X3-Y/Fe=XXX?!
?!
CONTROLLED ATMOSPHERE HEAT TREATMENT CAN BE SIMPLE AND SURE... AND IT DOESN'T TAKE COMPLICATED EQUIPMENT. HOW? USING THE DELAWARE FURNACE-
DELAWARE TOOL STEEL CORP.
WILMINGTON 99, DELAWARE
NOW ONE FURNACE FOR EVERY JOB!
-ON EVERY STEEL - CARBON TO HIGH SPEED!
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Get the FACTS on the simple DELAWARE Controlled Atmosphere Furnace. One furnace does every heat treating job on every type of tool and alloy steel. No scale No decarburization No hokus pokus. Send for Bulletin F-1.

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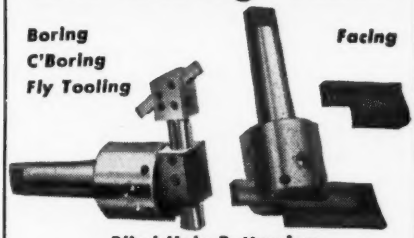

Blind Hole Bottoming

Many enthusiastic users report that the Behr Boring Bar actually pays for itself in the first four weeks of operation. Just ask the man who uses one.

This proven, patented bar is chatter proof, extremely accurate and ultra efficient. Has interchangeable blades and accessories. It is unequalled for versatility and efficiency.

BEPCO

Can you afford *not* to get the facts?

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BEHR PRODUCTS COMPANY
WARREN, MICHIGAN

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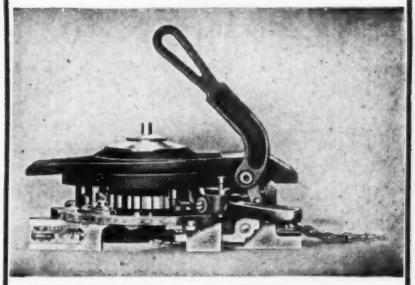

1.—1800 light cuts per hour.
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3.—Collets changed instantly.
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Model D—Ratchet indexing only—1" cap.
Model E—Both degree and ratchet indexing —Capacity up to 1".
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SURFACE PLATES RESCRAPED LIKE NEW

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73 W. Broadway, New York 7, N. Y.

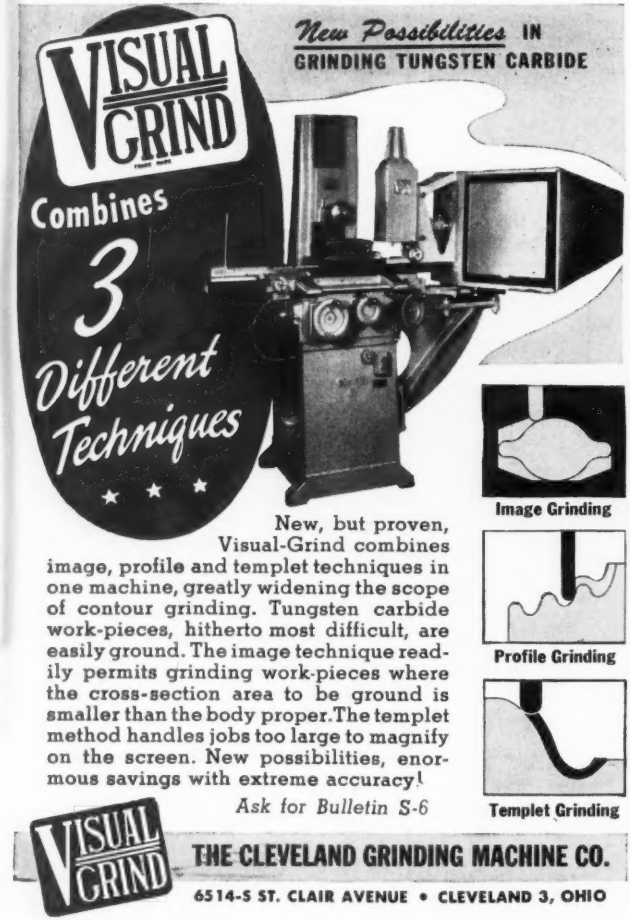
New President Announced by J. K. Smit and Sons

J. K. Smit & Sons, Inc., Murray Hill, N. J., manufacturer of industrial diamond products, has announced the election of Pieter Smit as president. Mr. Smit, who until recently was secretary-treasurer, is the third generation of his family to take an active interest in the leadership of the company. Johan J. Smit, Sr., continues as chairman of the board.

Rem-Cru Titanium Establishes Headquarters in Midland, Pa.

Headquarters of Rem-Cru Titanium, Inc., have been established at Midland, Pa., where the companys production, sales, and research on titanium and titanium alloys are to be centered. Rem-Cru is jointly owned by Remington Arms, Inc., and Crucible Steel Company of America.

According to C. I. Bradford, Rem-Cru Titanium director of operations, approximately 20 people have been moved from temporary headquarters in Bridgeport, Connecticut. Rem-Cru's production facilities are being installed in a plant area within the Midland Works of Crucible. The Rem-Cru Titanium organization is headed by Mr. C. I. Bradford. E. L. Wemple is production manager; George T. Fraser is sales manager; Walter E. Gregg is manager of accounting and services; Dr. W. L. Finlay is research manager; G. E. Hutchinson is supervisor of process engineering and control; and C. E. Newcomb is supervisor of equipment development.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New Possibilities IN GRINDING TUNGSTEN CARBIDE
Combines 3 Different Techniques
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New, but proven, Visual-Grind combines image, profile and templet techniques in one machine, greatly widening the scope of contour grinding. Tungsten carbide work-pieces, hitherto most difficult, are easily ground. The image technique readily permits grinding work-pieces where the cross-section area to be ground is smaller than the body proper. The templet method handles jobs too large to magnify on the screen. New possibilities, enormous savings with extreme accuracy!
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VISUAL GRIND
THE CLEVELAND GRINDING MACHINE CO.
6514-S ST. CLAIR AVENUE • CLEVELAND 3, OHIO

STERLING DRILL GRINDER

CAPACITY:
3/8" to 2½" drills.
5" x 9" adjustable table.

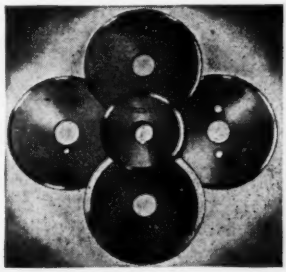
MOTOR: ½ hp, 3450 rpm.

NET WT: 250 lbs.

CRATED: 320 lbs.

McDONOUGH MANUFACTURING CO.
EAU CLAIRE, WISCONSIN, U. S. A.

FASTER



PIPE *and* TUBE CUTTING
. . . More Cuts per Wheel

Continental Steel Cut-Off Wheels, available for all makes of rotary cut-off machines, provide increased production . . . at modest cost.

Discs 7" dia., 3/32" and 1/8" thick carried in stock. Bore 1 1/16", 1 1/2", or 1 1/4". Special sizes made quickly. *Write for folder and prices.*

CONTINENTAL MACHINE CO.
1952 MAUD AVE. CHICAGO 14, ILL.

At last! A LOW COST AUTOMATIC *No Snatch Horizontal* STOCK REEL

THE *JACO REEL*

Rotates at just the speed to suit punch press feed. No power needed. Stock is taken from center of coil which lies on turntable. Natural spring of uncoiling material develops torque sufficient to rotate the 30" diam. ball-bearing mounted platen. Will handle practically any resilient coiled material up to 6" wide. *WRITE Today for Details.*

U. S. Pats. Pending

JACO DEVICES, Inc., 102 High Street, Hingham, Mass.

Whitney Chain Elects Two Vice Presidents

Winthrop H. Whitney, president of Whitney Chain Co., Hartford, Conn., has announced the election of James

James W. Anderson (left) and C. Robert Powers

W. Anderson as vice president-sales and C. Robert Powers as vice president-manufacturing. Mr. Anderson joined the company in January 1938 after 10 years of diversified activity in the power transmission industry. His initial field assignment was to the company's Chicago branch. Following this, he was assigned the responsibility of developing the distribution of Whitney products in the southwestern and western states, operating out of headquarters in Dallas, Texas. He was appointed general sales manager of the company in 1948.

Mr. Powers was formerly consultant to the president on all phases of Whitney manufacturing activities. Prior to joining the company, he was associated with the Dearborn Motor Corp., Detroit, Mich., an affiliate of the Ford Motor Company. In this capacity, he was divisional head in charge of production and engineering research and development. His early business associations included the United Shoe Machinery Co., Boston, Mass. He was also

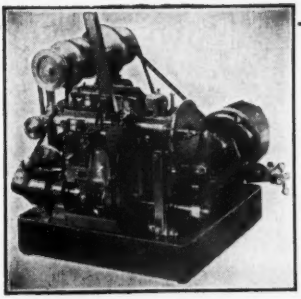
Rugged! Rigid! Accurate! Economical!

LOW COST OPERATION HIGH PRODUCTION MILLING MACHINES

Send for circular describing various models of power and hand feed millers and attachments.

The BURKE MACHINE TOOL CO.

A Division of the U. S. Burke-Machine Tool Co.
22 East 72nd Street Cincinnati 16, Ohio



WALTHAM

Pinion and Gear Cutting Machines

with revolving cutter will make 1, 2 or 3 successive cuts for watch pinions or may be used for fine pitch gears up to 1½" dia. Blanks are held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

Pinion and Gear Cutting Machine, Thread Milling Machine, Cylindrical Sub Presses, Cutter Sharpening Machine, Small thread milling and gear cutters, Small special machinery.

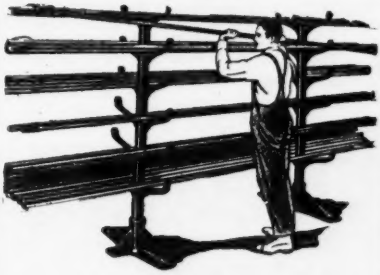
GRANT **RIVETERS**

• Pioneers in the riveting field. Head rivets from smallest to ¼" diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles. *Write for literature—and don't forget to send samples.*

THE GRANT MFG. & MACHINE CO.
96 Silliman Ave. Bridgeport 5, Conn.

SPEEDS UP STOCK-ROOM SERVICE

The BROWN SECTIONAL RACK saves the time previously lost in end-hauling each bar of stock its entire length from the old-style, closed-side Rack, the Brown Rack requiring but a few inches of side movement. Each length, width and thickness of stock is displayed in gold-fish visibility for instant selection. Workmen waiting for stock are served without waste of time.



Any time you require additional storage space, all you need do is add more units. If you want to relocate it at any time, you can do so quickly for it is unattached to the building.

It is a simple, durable article made of metal in five styles. It can't burn, warp, sag or twist; depreciation is practically nil. SEND FOR BULLETIN No. 26-B DESCRIBING

BROWN'S *QUICK-SERVE* RACKS

BROWN ENGINEERING CO.
120 N. THIRD ST. READING, PA.
RACKS • VISES • CLUTCHES • COUPLINGS

associated with Brown & Sharpe Mfg. Co., Providence, R. I., in production control capacities.

Rodney C. Gott Named AMF Vice President

Rodney C. Gott has been named a vice president of American Machine and Foundry Company, New York City. Formerly assistant to the president of AMF in charge of commercial research and development, Mr. Gott, in his new official capacity, will supervise the activities of three of American Machine and Foundry Company's major subsidaries. In addition, he will direct the operations of the company's commercial research and development department, the Lowerator dispenser division, and the sales and distribution of AMF's Wahlstrom tools and jet tobacco curer.

Rodney C. Gott

Mr. Gott has been with AMF since his discharge with the Army in 1945 with the rank of colonel. A graduate of the United States Military Academy at West Point, class of 1933, with a bachelor of science in engineering, he served two years with the regular Army's Engineering Corps. before resigning to join the American Radiator and Standard Sanitary Corporation. He was recalled to the Army in 1941 and joined AMF in 1945 upon his discharge from the service.

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with the

V&O FEED-O-MATIC POWER PRESS FEEDER

THE V&O PRESS COMPANY
DIVISION OF EMHART MANUFACTURING COMPANY
Builders of Precision POWER PRESSES and FEEDS
Since 1889 HUDSON, N.Y.

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For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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The Fast Cutting Thread File
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8 THREADS ON EACH FILE
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DEALER INQUIRIES INVITED

Order a Pair Today From
BOX N213 KROME, Inc. READING PENNA.

Now— "JOB-INDEXED" marking devices

Ever notice how difficult it is— in the average catalog—to find EXACTLY the right kind of hand or machine marking device?

New Method's *new catalog* classifies them by the jobs they do... in easy-to-find fashion.

Get your copy. Ask for Catalog No. NM-51.

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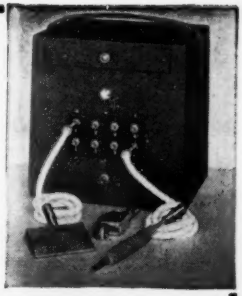
MARK IRON, STEEL and CARBIDES



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Mark *hardened parts*, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly. • Three sizes to meet all requirements.

• *Write for circulars and prices.*

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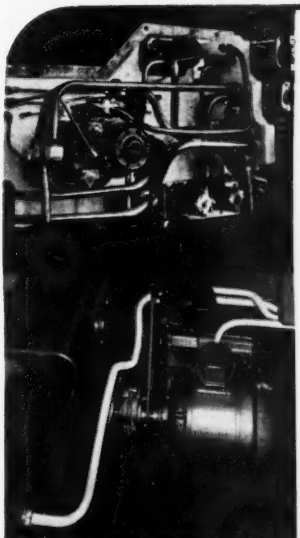
P. O. Box 191 Tenafly, N. J.



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SMOOTH, accurate small-radius bends made quickly in pipe, tubing, conduit with Greenlee Hand Bender

Forming small-radius bends without flattening or kinks is simple, speedy work with a GREENLEE Hand Bender. Ideal in the shop for pipe and tubing installations on machines . . . especially designed to form neat bends for sharp corners, nooks and other close quarters. Various models and sizes for steel, copper, brass and aluminum tubing or pipe, rigid and thin-wall conduit. Write for facts. Greenlee Tool Co., 1986 Herbert Avenue, Rockford, Ill.

TOOLS FOR CRAFTSMEN
GREENLEE

K. R. Wilson Appoints Factory Manager

K. R. Wilson, manufacturer of hydraulic presses, automotive service tools, and garage equipment, has announced the appointment of Edgar J. Reichelderfer as factory manager of its plant at Arcade, New York. Mr. Reichelderfer comes to K. R. Wilson with an excellent background of practical, technical, and administrative experience gained from 25 years of active participation in the engineering and manufacture of automotive tools, parts, and equipment. Most recently employed by Trico Products Corporation as superintendent of Plants 2 and 5, he is a member of the American Society of Tool Engineers and the American Society for Metals.

E. J. Reichelderfer

Gisholt Balancing School

To provide design engineers, tool engineers, production men, and maintenance men with adequate information for a thorough understanding of the theory and practice of balancing rotating parts, the Gisholt Machine Co., Madison 10, Wis., is offering a Balancing School to be conducted in the plant of the company. Lecture and discussion groups will be held in a conference room in the firm's engineering building. Practical applications of balancing, together with information on balancing machine maintenance, will be presented in the balancing machine

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Specify CLARK STEEL BALL PENETRATORS

● For dependably accurate hardness testing, every part of your testing equipment must be designed by experts. CLARK Hardened Steel Ball Penetrators are designed to give the most accurate possible results in the testing of soft metals such as unhardened steel, cast iron, brass, bronze, and similar metals and alloys. They are available in 1/16" and 1/8" diameters at $5.00, and in 1/4", 1/2", 3/4" and 1" diameters at slightly higher prices. Specify CLARK Steel Ball Penetrators for more accurate "Rockwell" testing.

$5.00 Each
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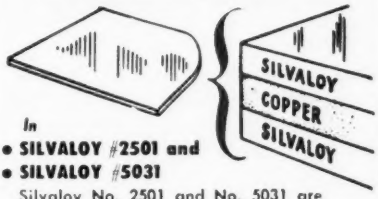
PLYMETAL BRAZING SHIMS
for *CARBIDE TOOL TIPS*



In

- **SILVALOY #2501 and**
- **SILVALOY #5031**

Silvaloy No. 2501 and No. 5031 are clad materials furnished in three thicknesses:

.020 thick consists of .010 copper center—clad both sides with .005 Silvaloy No. 2501
.011 thick consists of .005 copper center—clad both sides with .003 Silvaloy No. 503
.016 thick consists of .008 copper center—clad both sides with .004 Silvaloy No. 503

Each of the alloys are furnished with or without radius, square or rectangular, Pentagon shape 80 degree with radius, Pentagon shape 60 degree no radius, triangle, circles, etc. Available in all standard tool sizes.

Shims are also available in Silvaloy No. 503, No. 2501, Contantine and Copper.

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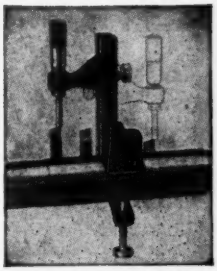
SAVE TIME
With Bartelt Gages



• Use a Bartelt Pedestal Micrometer for setting boring tools and for many other shop operations requiring accurate positioning relative to a fixed base. Make settings in one step — eliminate cut-and-try-methods. Model B, with reversible slide, shown. *Write for literature describing all models.*

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BELOIT • WISCONSIN

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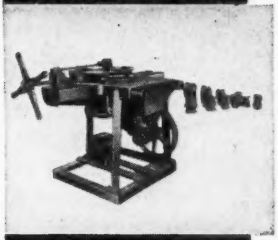

Motor-Powered "American" 2PB

bend pipe by hand or power with
"American"
cold pipe, conduit and heavy wall tube
BENDING MACHINES
Fast... Simple... Dependable...

RADIANT HEAT BENDS in Standard Pipe

Fast . . . Accurate . . . Average bend takes only 10 seconds! Up to 180° bends . . . all sizes from ½" to 2". Usual radiant heat bends for 1¼" at 6" and 9" radii can be supplied. Only 7 parts. Occupies 18" x 18" floor space.

Capacity ½" to 2" standard pipe . . . Minimum radius 5 times pipe diameter up to 180° . . . Maximum radius 13". Complete with rolls for each size pipe. Standard motor equipment 2 h.p.

Special radii supplied on request.

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14 Furnace St., Poultney, Vt.

laboratory, test floor, and assembly departments.

Each class will be limited to an enrollment of eight men so that each student may be given personal instruction by the instructor. This will include open time in which the students may bring up balancing problems from their own companies for discussion and solution. School hours will be from 8:00 A.M. to 12:00 Noon and from 1:00 P.M. to 5:00 P.M. each day Monday through Friday.

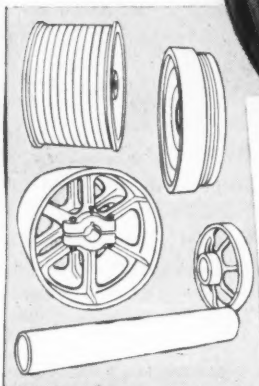
Two separate courses are being offered. The first section of each course will be the same and will consist of a careful study of the balancing problem. The remainder of the course will be devoted to a detailed study of one type of Gisholt balancing machine—either the Type "S" or the Type "U" balancing machine. The "S" Course will be of two weeks' duration with a minimum of 80 student hours of instruction. The "U" Course will last for three weeks with a minimum of 100 student hours of instruction. Special arrangements can be made for students who wish to take both courses.

The tuition of the Type "S" Course, which is scheduled for July 9-20 and September 10-21, is $100. The tuition for the Type "U" Course, which is scheduled for June 11-29 and August 6-24, is $150. Complete details regarding these courses can be obtained by writing direct to the Gisholt Machine Company.

PYOTT

for SPECIAL SIZE ROUND CASTINGS

MADE FROM STOCK PATTERNS 2" TO 144" SIZE RANGE



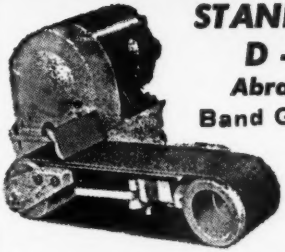
Pulleys, Flywheels, Sheaves, Gear Blanks, Capstans, Rolls, Drums, Etc.

Just send Pyott a rough sketch of the special size casting you want, including dimensions. Pyott foundry skill and stock patterns will insure quality and save you time and money. Write now, for the PYOTT SPECIAL SIZE CASTINGS FOLDER.

PYOTT FOUNDRY & MACHINE CO.

333 NORTH SANGAMON STREET • CHICAGO 7, ILLINOIS

Flat Belt Pulleys . . . V-Belt Sheaves . . . Quee-Dee Flat Belt Pulleys . . . V-Belts . . . Gears . . . Couplings . . . Sprockets . . . Flywheels



STANDARD D - 4 Abrasive Band Grinder

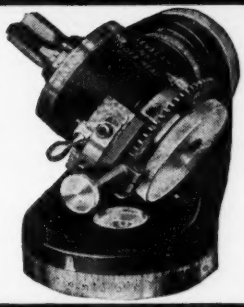
Famous for Stamina

This new, streamlined bench type grinder, assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

TOOL HOLDER INDEXING HEADS



Hold 1/16" up to 1½" Collets 5C or 1AM Collets and Brown & Sharpe or Morse Taper. Will adjust to any compound angle.

GRINDERS & FIXTURES INC.
8329 Clinton Road Cleveland 9, Ohio

SAWMASTER HACK SAW

LOW PRICED
•
PORTABLE
SELF-CONTAINED
•
READY TO WORK
Angle Cutting Vise
STURDY
ECONOMICAL

Write for Bulletin No. 300

MILLER-KNUTH MFG. CO. OMAHA, NEB.

Wash drawing of new office and showroom jointly opened in Chicago by Bryant Chucking Grinder Co., Fellows Gear Shaper Co., and Jones & Lamson Machine Company.

Three Vermont Machine Tool Builders Open New Office and Showroom in Chicago

The Bryant Chucking Grinder Company, Fellows Gear Shaper Company, and Jones & Lamson Machine Company, all machine tool builders of Vermont, have opened a new office and showroom in Chicago, Illinois, which is to be occupied jointly by these companies.

The newly constructed single-story building is located at 5835 West North Avenue. The three companies will be represented by the same personnel as heretofore.

for greater RIGIDITY more ACCURATE cuts

use CRITERION BORING HEADS

A full line of adjustable boring heads and bars now available. Heads 1½" to 7" dia. Carbide or high speed bars ⅜" to 1¾" dia. Lead screws ground AFTER HARDENING. Ample bearing surface, heat treated parts, interchangeable shanks. Criterion tools are the criterion. Write for free catalog and costs.

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AUTOMATIC REVERSE TAPPERS

- **Automatic Torque Control, One Minute to Adjust, Prevents Tap Breakage, Operator Need Not Be Skilled.**
- **WIDE RANGE TAP CAPACITY.**

No. 1 FRICTION DRIVE TAPPER—capacity No. 2-56 to ⅜" in Steel—½" in Aluminum.

No. 2B POSITIVE TAPPER—capacity ⅜" to ⅞" in Steel.

No. 3A POSITIVE TAPPER—capacity ½" to 1¼" in Steel—½" to ¾" Pipe Taps.

No. 4A TAPPER — capacity ¾" to 2" in Steel including Pipe Taps.

- **PRODUCTION THREADERS with Round Split . . . Button . . . Acorn Dies.**

Priced from $48.00
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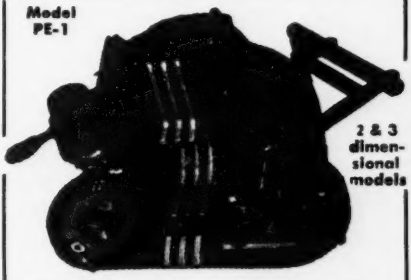
Division of Thomson Industries, Inc.
1034 N. PLUM STREET, LANCASTER, PA.
STANDARD UNIVERSAL ADJUSTABLE AND SPECIAL FIXED CENTER DRILLHEADS

Model PE-1



2 & 3 dimensional models

Variable Ratio Pantographs, Pantograph Controlled, Profiling Vertical Millers.

For Contour Milling, Profiling, Intricate Cams, Calibrating, Die and Mold making. Engraves on curved surfaces without special templates, with smooth lines in any design, number, letter; on iron, brass, copper, aluminum, soft steels and all plastics • Drills a series of holes • Increases accuracy and production • Etches glass and similar items • For information and prices write Dept. M.

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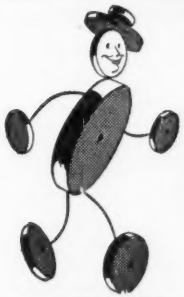
Florida Hill Rd., Ridgefield, Conn.



Cut grinding costs . . . with rugged QUEEN CITY Grinders

Queen City Grinders are built to stand up under the heavy work that pours through the shop daily. Noted for their durability, freedom from downtime and low cost, Queen City Grinders cut grinding costs to the bone. • Order today a battery of these low cost grinders and eliminate "ganging up" around one lone grinder.

QUEEN CITY
Machine Tool Co.
223 E. 2nd St.,
Cincinnati 2, Ohio

QUEEN CITY MACHINE TOOL CO

S. Duncan Black

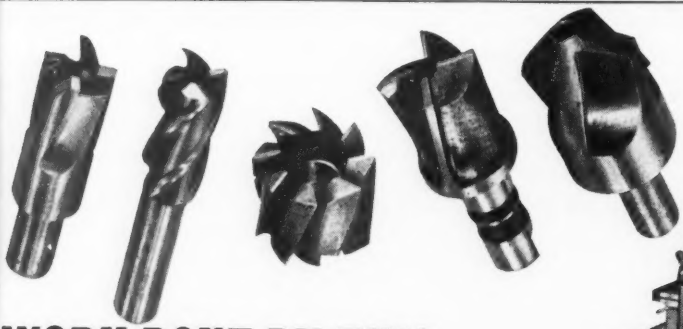
S. Duncan Black, president of The Black & Decker Mfg. Co., Towson, Md., manufacturer of portable electric tools, died recently of a cerebral hemorrhage at the age of 67. Co-founder of the firm with Alonzo G. Decker 40 years ago, Mr. Black had continued as the active head of the company until his death.

S. Duncan Black

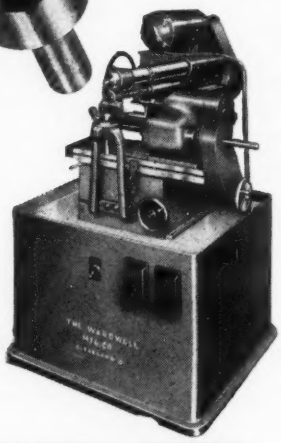
Mr. Black went to work at the age of 16 for the Rowland Telegraphic Company which was then experimenting with the forerunner of the teletype machine. He started as tracer but soon advanced through the jobs of draftsman, designer, experimental engineer, factory superintendent, and salesman. It was here that he met Mr. Decker, who has now been elected president of Black & Decker to succeed Mr. Black. When the latter company was started in 1910, it had seven machinists working in rented warehouse space making special machinery to order. Mr. Black served as salesman and administrator for the company, while Mr. Decker handled the production problems. Today, Black & Decker has its main office and plant in Towson, Maryland, where approximately 2,200 people are employed in the manufacture of portable electric tools.

New Britain Machine Company Announces New Officers

The announcement of important changes and promotions among the



Write for Bulletin 90FM Hydraulic Flutemiller



WORK DONE BY THIS AUTOMATIC FLUTEMILLER

- Mills straight and spiral flutes
- Mills tool automatically, no attention required
- Low in cost
- No special skill

The WARDWELL Mfg. Co.

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RIVETING?

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FAST RIVETING WITHOUT NOISE

Put your production jobs on Linley Spinner Type Riveting Machines. No hammering! They spin rivet with twin rollers. In most cases the actual riveting time is one second per rivet, so that you can watch costs come down while noise is entirely eliminated! Direct Motor or Vee-Belt Driven. Bench or floor types.

Send samples of your work for free riveting, cost of equipment and true estimate on production.

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SAVAGE

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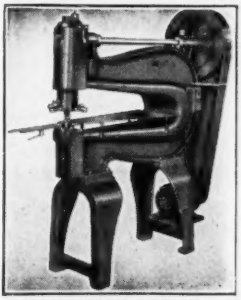

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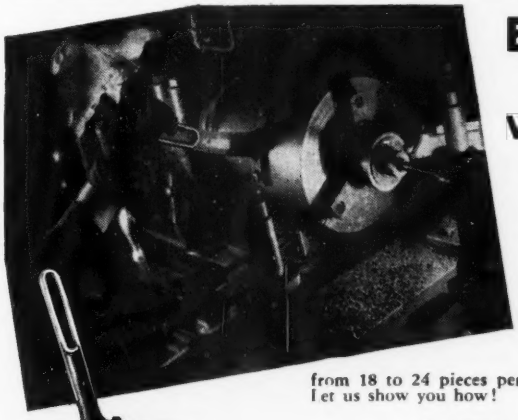
FOR TUBE SLOTTING, TUBE SHAPING AND CUTTING FLAT SHEETS BY TEMPLATE OR TO A SCRIBED LINE.

W. J. SAVAGE COMPANY

Knoxville *Since 1885* Tennessee

PIONEER MFRS. OF NIBBLING MACHINES



BARKER

(Two-Jaw or Three-Jaw)

WRENCHLESS CHUCK

will pay for itself in 60 to 90 days on production schedules by giving MORE parts per hour at a LOWER cost per part. Most round parts can be set in the Barker Wrenchless Chuck without stopping the machine. It saves time, helps speed up production, and cuts spoilage where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine. The Barker Chuck shown here, replacing an ordinary 3-jaw chuck, jumped production from 18 to 24 pieces per hour. It can do it in *your* plant too. Let us show you how!

Write for bulletin 201 today

Chuck Division

THOMAS HOIST CO.

28 S. HOYNE CHICAGO 12

officers of The New Britain Machine Co., New Britain, Conn., was made by Chairman Herbert H. Pease following the annual meeting of the board of directors. Mr. Pease has retired as president but continues as chairman of the board. Robert T. Frisbie, who has been first vice president, was elected president. Ralph S. Howe, who has been vice president, was elected executive vice president. Julian C. Pease, who has been secretary, was elected a vice president and also a director. William J. Lofgren, who has been treasurer, was elected secretary and treasurer.

At the stockholders' meeting, the following directors were elected: Leon P. Broadhurst of Hartford and Robert S. Brown, Robert T. Frisbie, Ralph S. Howe, Donald H. Montgomery, Herbert H. Pease, Maurice H. Pease, Maurice Stanley, Philip B. Stanley, Frank G. Viberts and Julian C. Pease, all of New Britain. The directors elected the following officers; chairman of the board, Herbert H. Pease; president, Robert T. Frisbie; executive vice president, Ralph S. Howe; vice presidents: Products, Arno W. Gaebelein; Machine Tool Division, Julian C. Pease; Lucas Machine Division, Cleveland, Hallis N. Stephan; Special Developments, Donald H. Montgomery; Industrial Relations, Nathaniel W. Morrow; secretary and treasurer, William J. Lofgren; assistant treasurer and controller, Donald W. Freeman.

TAC does what no other tool can do!
AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true universal wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from ⅜" to 4". Smallest effective ratcheting arc yet — 5° to 7½°. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.
makers of advanced tools for industry
TAC
TAC is the registered trademark of
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HOWALD CARBIDE MILLING CUTTERS

- SQUARE BLADES Easily Replaced.
- Simple, Accurate Blade Adjustment.
- Lowest Blade Cost.
- Cutters from 1½" to 14" dia.

PATENTED END MILL

SHELL MILL

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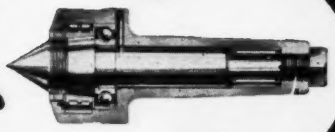
W. T. HOWALD
MACHINE WORKS
182 SIGOURNEY ST., BROOKLYN 31, N. Y.

NIELSEN
Heavy Duty Live Centers



Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

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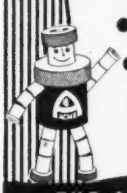
Acme Offers Complete Facilities for All Types of

PRECISION GRINDING

FAST SERVICE... EXPERT WORKMANSHIP... LOW COST



- INTERNAL
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- CRUSH FORM
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- TWIN DISC
- SURFACE
- THREAD

Acme is equipped to handle all types of precision grinding. Expert craftsmen, using newest methods and modern equipment, will do the job for you faster, better, more economically. Acme also offers a flat lapping service that can finish surfaces to within millionths. Write for details.

Acme Industrial Company
Makers of Standardized Jig & Fixture Bushings
212 N. LAFLIN ST. CHICAGO 7, ILLINOIS

THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

Frank U. Hayes Elected Bullard Vice President

Frank U. Hayes, sales manager of The Bullard Co., Bridgeport, Conn., manufacturer of machine tools, was elected vice president at the company's annual meeting of directors. Mr. Hayes, who was elected to the board of directors of the company on September 26, 1950, has been connected with Bullard for 16 years and has served in numerous capacities from the manufacturing phases up to his present positions of vice president and sales manager of the company.

Frank U. Hayes

Four Officers of Warner and Swasey Appointed to New Posts

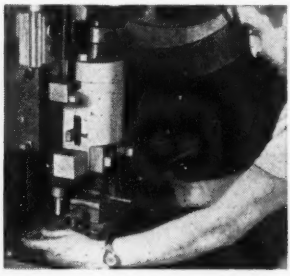
Four officers of the Warner & Swasey Co., Cleveland, Ohio, were appointed to new posts at a directors' meeting following the company's annual meeting. C. W. Bliss, formerly the controller of the company, was elected treasurer. Irving C. Bolton, formerly treasurer, was elected financial vice president; E. B. Gausby, formerly assistant treasurer, was elected secretary; and Warner Seely, formerly secretary, was elected vice president.

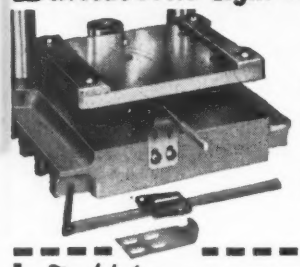
Officers reelected to present positions by the directors were Charles J. Stilwell, president; L. D. McDonald, executive vice president; Donald M. Pattison, sales vice president; Walter K. Bailey, manufacturing vice president; Myron S. Curtis, director of engineering; and Helen Heinmiller, assistant secretary.

Adjustable Automatic Stock

FEED STOP for DIES

Dahlstrom Light Duty AUTOSTOP





No drill jig . . .
No slotting . . .
No milling . . .

Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent.

To Install: Just drill one 7/36 inch hole, then drill and tap four mounting holes per directions. That's all there is to it!

Trial order $1.75 each; lots of 12 $1.50. *Write for free pamphlet.*

***By the makers of the* DAHLSTROM TAP GUIDE**

Dahlstrom MANUFACTURING CO. • 2522 W. Larpenteur Ave. • St. Paul 8, Minn.

Enclosed **$1.75** for Autostop for use on Compound Die ( ) Progressive Die ( ).

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YOU PROFIT on every job you send to Rutland!

Rutland reworked or repaired cutting tools are guaranteed to give new tool performance — at a fraction of the new tool cost.

Recutting • repairing • replacing Carbide tips. Special tools from obsolete or standard tools, etc.

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STRAIGHT RODS

1/32" to 1/2" Diameter
Diam. Tol. .0005" on Rods Up to 6' Long.
Diam. Tol. .001" on Rods Up to 12' Long.

Quick Delivery
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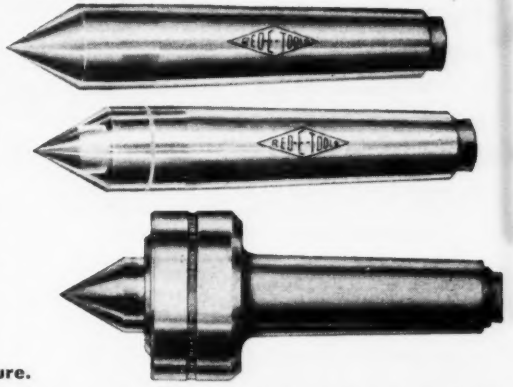

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CENTER *Specialists Since* 1908

RED-E-TOOLS

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540 Iranistan Ave. **Bridgeport 8, Conn.**
Export Dept.: 21 West St., New York 6, N. Y.

Norton Distributors' Council

The Norton Co., Worcester, Mass., has announced the formation of the Norton Distributors' Advisory Council made up of representatives of 11 Norton abrasive distributors from Connecticut to California. Believed to be the first of its kind in the abrasive industry, the council has been organized in an effort to obtain the benefit of the experience of representative distributor men so as to improve the selling job which the company has been doing.

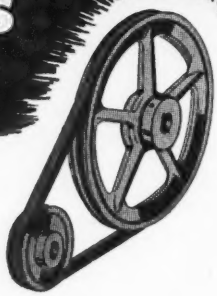
Membership in the new council will vary from one to three years. Members of the first group include Howard B. Begg, general manager and treasurer, Squier, Schilling & Skiff, Inc., Newark, N. J.; Howard J. Behn, president, H. J. Behn & Co., Inc., Bridgeport, Conn.; Lewis W. Gilbert, president, Screw Machine Supply Co., Chicago, Ill.; Lloyd B. Mize, president, Industrial Supply, Corp., Richmond, Va.; J. D. Nicholson, general manager, The Mine & Smelter Supply Co., Denver, Colo.; J. Stewart Plowden, president, Plowden Supply Co., Houston, Tex.; Wilson W. Radcliffe, president, The E. A. Kinsey Co., Cincinnati, Ohio; Russell Rising, vice president, Ducommun Metals & Supply Co., Los Angeles, Calif.; Harry E. Ruhf, president, Cleveland Tool & Supply Co., Cleveland, Ohio; Miles I. Stray, president, Chas. A. Templeton, Inc., Waterbury, Conn.; and Harold E. Torell, vice president, Syracuse Supply Co., Syracuse, New York. Norton Company

MAUREY

FHP

V-DRIVES

Your Best Buy Three Ways



FOR SERVICE...

Fast Maurey delivery keeps up with your production line —prevents delay, speeds output.

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You pay no more for the extra quality and service Maurey gives. You *save* on the better performance and longer service that Maurey quality assures.

FOR COMPLETENESS...

Complete stocks of MOR-GRIP V-belts meet all FHP needs. 1736 stock sizes of Hi-Q V-Pulleys for any FHP speed ratio or standard shaft. In addition, Maurey builds special V-Drives to meet special requirements.

Write for these FREE Maurey Bulletins:
Bulletin FHP 101 informs about MOR-GRIP V-BELTS
Bulletin OEM 2000 informs about Hi-Q V-PULLEYS

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World's Largest Manufacturer of Pressed Steel and Cast Iron Single Groove V-Pulleys

2908 S. Wabash Avenue • Chicago 16, Illinois

SEIBERT DRILLING MACHINE PARTS

Pinion Shafts
Upper Drives
Lower Drives
Universal Joints
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Slip Spindles
Bracket Spindles

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Morse Taper Adapters With and Without Set Screw Slots

Shur-Lock Micro Nuts

Consult SEIBERT engineers before retooling or replacing parts on multiple spindle machines.

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Manufactured by

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SOLD THRU LEADING SUPPLY HOUSES

GROBET CHATTERLESS COUNTERSINKS

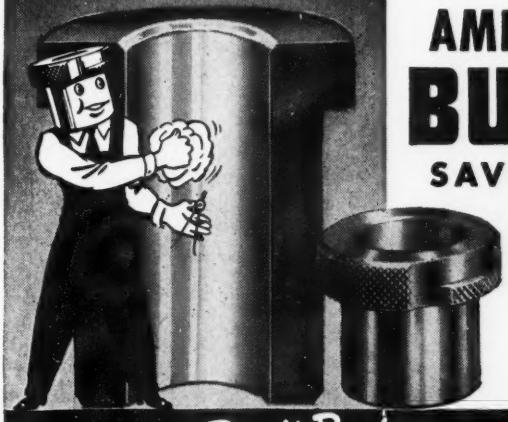
Six staggered cutting edges give shearing cut that eliminates all chatter.

Send for catalog BC1.

GROBET FILE CO. of AMERICA, INC.

421 Canal Street N. Y. 13, N. Y.

PRECISION MADE



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AMERICAN DRILL JIG BUSHINGS

SAVE YOU MONEY

Send for catalog and name of nearest distributor

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SPECIALIZING ONLY IN DRILL BUSHINGS

"Get them from Gillen"

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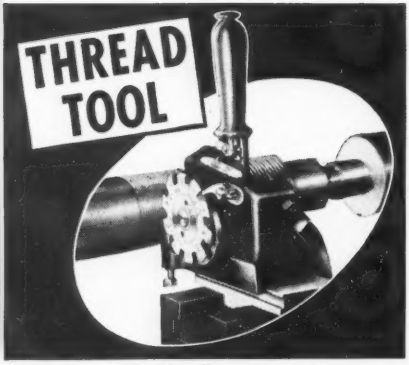
THREAD TOOL



Mounts on any screw cutting lathe and produces a perfect thread independent of operator skill. Indexing system presents each of ten cutter teeth successively to the work allowing maximum cuts to produce a perfectly formed thread. Duplicates threads without gauging. Write for Bulletin 110.

RIVETT LATHE & GRINDER, Inc.
MMSA-6 Brighton 35, Boston, Mass.
For more Precision Work
RELY ON RIVETT, The Master Craftsman's Master Tools

members include Ralph M. Johnson, vice president in charge of sales, Abrasive Division; George A. Park, sales manager, eastern region; Fred L. Curtis, sales manager, western region; Donald L. Price, sales manager, central region; William E. Shumway, manager, sales engineering; C. John Sundberg, manager, Worcester sales office; Robert H. Cannon, merchandising engineer (all of the Abrasive Division) and C. Leonard Shaw, publicity manager.

Two Vice Presidents Elected by Raybestos-Manhattan, Incorporated

The election of George W. Marshall, Jr., and Alvin F. Heinsohn as vice presidents of Raybestos-Manhattan, Inc., Passaic, N. J., has been announced by John F. D. Rohrbach, president. Mr. Marshall, who has been sales manager of the company's Asbestos Products Division since 1947, will continue to direct sales activities on asbestos brake linings, clutch facings, asbestos textiles, mechanical packings, and powdered metal friction material. His headquarters are at Raybestos-Manhattan's Manheim, Pennsylvania plant.

Mr. Heinsohn will be vice president in charge of the company's General Asbestos and Rubber Division at North Charleston, South Carolina. He has been general manager of the North Charleston plant since 1944. Both Mr. Marshall and Mr. Heinsohn are directors of Raybestos-Manhattan, Incorporated.

Other elections announced were W. Ward Kievit, Passaic, N. J., assistant treasurer; William H. White, Passaic, N. J., assistant secretary; and Charles J. Geilfuss, North Charleston, S. C., assistant secretary.

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CONTINUOUS HINGES

Manufactured by

AUTO MOULDING & MFG. CO.

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"ALL-WAY" LEVEL

The Fell Precision **Level** shows the level of all directions at once to an accuracy of .0005 inch per foot. It saves time in the manufacture and maintenance of machinery. Made in sizes 3½" x 6" and 5½" x 12", also 4" and 5" dia. for permanent mounting.

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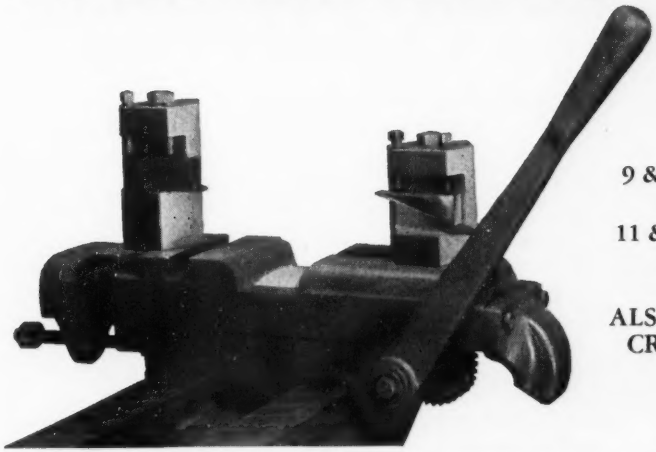

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$59.75
11 & 12" LATHES
$64.75

ALSO CARRIAGE CROSS SLIDES

Prompt Delivery

MACHINE TOOL DIVISION OF

GLOBE PRODUCTS-HEAT SEAL CORPORATION

3380 Robertson Boulevard • Los Angeles 34, California, U. S. A.

New SPS Sales Officials

Two promotions in the inside sales force of Standard Pressed Steel Co., Jenkintown, Pa., have been announced by J. Whiting Friel, vice president in charge of sales. C. W. Hollingsworth, formerly manager of the "Unbrako" Socket Screw Division, becomes divisional sales manager, heading up the "Unbrako" Socket Screw, "Flexloc" Lock-Nut, and "Hallowell" Steel Collar Divisions of the company. Mr. Hollingsworth has spent his entire business career with SPS, having started with the company as a clerk in 1916.

C. W. Hollingsworth (left) and Raymond N. Gruber

Raymond N. Gruber succeeds Mr. Hollingsworth as manager of the "Unbrako" Socket Screw Division. Since coming with the company in 1937, Mr. Gruber has had wide experience in manufacturing, cost accounting, sales, and sales promotion.

Carboloy Launches Technical Data Program for Defense Industries

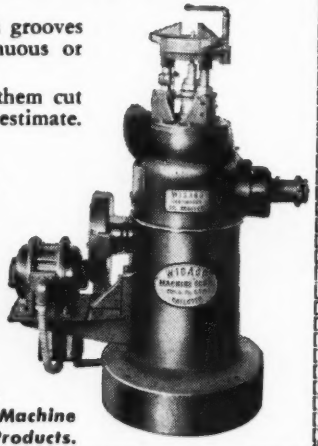
A broad service program of furnishing vital technical production data to defense industries to enable such industries to obtain maximum productivity with minimum tooling in the

HIGH SPEED PRODUCTION
CONTINUOUS OIL GROOVING

WICACO CONTINUOUS OIL GROOVER cuts grooves of all descriptions, internal or external, continuous or intermittent.

Send us samples for grooving. We will return them cut to specifications, with a record of time and cost estimate. No obligation.

Ask For Descriptive Booklet And See How You Can Improve Your Production.



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SINCE 1868
WAYNE JUNCTION, PHILA. 44, PA.
Manufacturers of
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Roller Bearing Twister Spindles—Spindle Oiling Machine
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Let Littleford show you how precision fabrication can be had at low cost. Send Blueprints for estimate.

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433 E. Pearl St., Cincinnati 2, Ohio

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DURANT Stock Oiler

- Prolongs Life of Die
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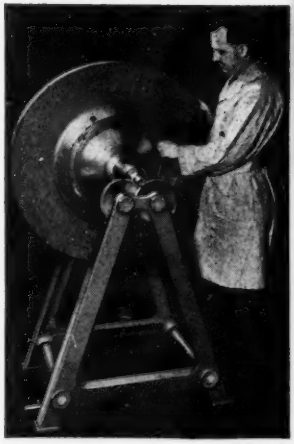
Anderson BALANCING WAYS

Shops handling rotating parts find this simple, sturdy and thoroughly dependable device highly efficient for balancing and truing operations. It assures better work . . . saves time . . . saves labor. No leveling required.



Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate indication of whether or not the work is in perfect balance.

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

ROCKFORD Anderson BROS. MFG. CO. ILLINOIS

Write for Bulletin No. 6-22

ANDERSON BROS. MFG. CO., Rockford, Ill.

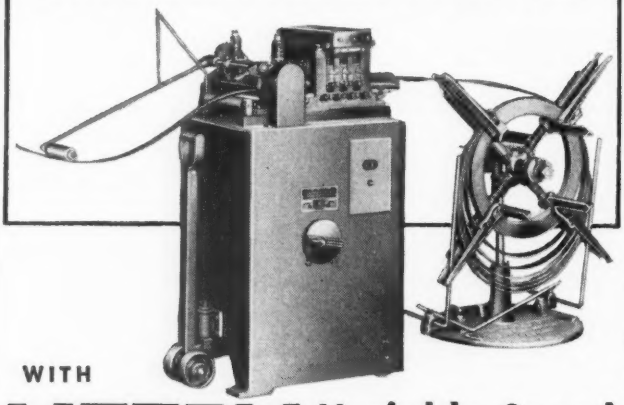
Balancing Ways, Roto Checkers, Hand and Power Scrapers, Spotters, Hand and Power Hydraulic Straightening Presses.

manufacture of products for the armed service has been launched by Carboloy Company, Inc., Detroit. First step in the program has been the accumulation by a staff of Carboloy engineers of all currently available data on the machining of shells and compiling this data in a complete kit for manufacturers who already have shell production contracts or who are or may be bidding on such contracts.

Since the shell machining program includes data on the latest practices as developed by individual companies or in U. S. Arsenals, it is considered by Carboloy as being of a restricted nature and distribution is being closely controlled. Each kit is registered. Although the kit itself—weighing in excess of 5 lb.—is unusually complete, containing data not only on feeds and speeds, tool application and grinding, tool design and brazing, but also on tool layouts and methods of ensuring maximum tool conservation, the service program to shell producers does not end here. As rapidly as new developments in shell machining practices and equipment become available, supplementary data will be furnished to all holders of registered kits.

In general, kits are made up to suit the needs of the individual producer. There is a basic kit containing data on World War II practices and general information applicable to the machining of all sizes of shells. With this, as the case may be goes specific informa-

STRAIGHTEN COIL STOCK
FOR PRESSES, SHEARS OR SLITTERS



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Output rises, costs drop when coil stock is fed to the press, the shear, or the slitter through a Littell Straightening Machine. Coil stock comes out of a Littell Straightener flat, with curvature removed. Equipped with variable speed transmissions, Littell Straighteners are easily adjusted to meet a wide range of speed requirements. Thirteen medium and heavy duty models straighten coil stock of all standard widths and thickness.

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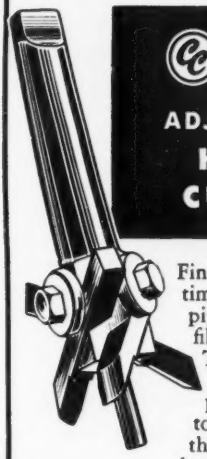

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ADJUSTABLE HOLE CUTTER

Finished cuts the first time in boiler plate, pipe, plastics, hard fibre, stainless steel, Transite, etc. 7 models cut variable expansions from 5/8" to 5" holes, with thickness capacities from thin sheets to 1".

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Manufacturers of Precision Cutting Tools

For 50 Years
MOLINE "HOLE-HOG"
MACHINE TOOLS
HAVE SERVED
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DRILLING - BORING -
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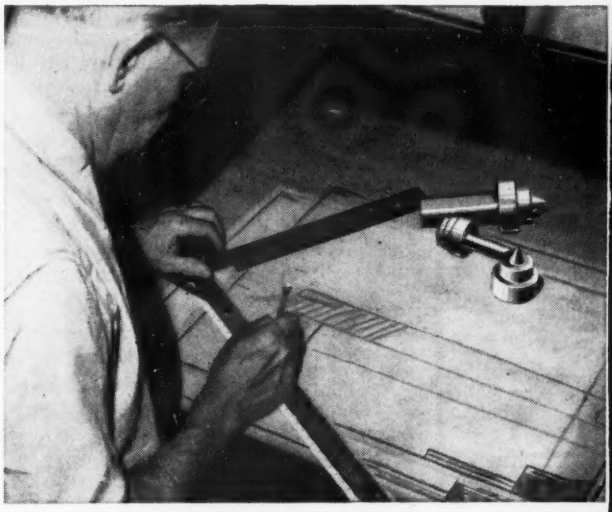
and SPECIAL MACHINES

MOLINE TOOL COMPANY
102 20th St. MOLINE, ILLINOIS



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Engineered Live Centers . . A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job is set up with the right Live Center. Standard shanks with Morse taper carried in stock.

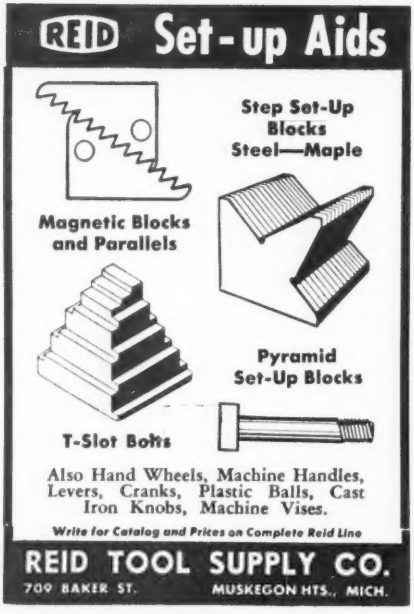
tion on the practices for different shell sizes. At present 90, 105, 120 and 155 mm. shells are covered in this manner.

In order to control distribution, no kits will be mailed on request. Where a company already has a shell contract or where a company has been "cleared" by army ordnance to bid on shell contracts, a registered kit will be delivered to the company directly by Carboloy field engineers. In addition, supplemental data, as issued, will be available only to holders of registered kits. The company already has under way a compilation of data on machining of other defense products, each of which is to be handled in a similar manner. In each case, important consideration is being given to ways and means of reducing consumption of carbide tools to the minimum by ensuring maximum effectiveness of carbide tool use where such tools are required.

Sebastian Lathe Company Acquired by Cincinnati Metalcrafts, Incorporated

The Sebastian Lathe Co., Cincinnati, Ohio, established in 1885, has been acquired by Cincinnati Metalcrafts, Incorporated. The assets and trade name of the lathe company were sold by American Steel Foundries, the former owner, who retained the plant and manufacturing facilities.

The newly acquired company will be known as The Sebastian Lathe Division, Cincinnati Metalcrafts, Incorporated. Manufacturing and administrative operations have been moved to the modern plant of Cincinnati Metalcrafts, Inc., 5000 Brotherton Rd., Cincinnati, Ohio. New production machine tools have been added to existing facilities, and production schedules will be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. . . because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

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Headless Set Screws

Socket Set Screws

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PRECISION KEYWAYS with an ADJUSTABLE GLENNY PUSH BROACH

Production or short-run keyway cutting can be accomplished in all types of bushings, sleeves, gears, etc., with the GLENNY adjustable push broach. Featuring 0.0005-inch accuracy, it can be instantly adjusted and micrometer checked for precision operations.

SPECIFY GLENNY . . . greater strength . . . maximum accuracy . . . fully adjustable for depth . . . interchangeable high-speed blades . . . bushing adapters available . . . will cut tapered keyways . . . hardened tool-steel external parts.

GLENNY broach sets are available for cutting keyways in bores ranging in diameter from 1/4" to 2 1/2".

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KASE MACHINE COMPANY
Please send (without obligation) your new Bulletin No. 13 containing sizes, specifications and prices of GLENNY broaches and kits.

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REGULAR OR SPECIAL DESIGN TO 25" O.D.

For Quality, Dependability and Price

We also make Thrust Bearings interchangeable with other manufacturers. We take in extra work on Blanchard Grinders.

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EMERY CORDS and TAPES

For Polishing And Burring

Small holes, slots, dies, etc.

"The Machinist's Friend"

Useful in many ways.

Available on spools in the following sizes and grits.

No.	Diam.	Grain	No.	Diam.	Grain
49	.082	120	60	.015	200
50	.070	180	66	.012	Cro.
51	.055	120	56	3-32	180
52	.055	150	57	4-32	180
53	.040	180	58	7-32	150
54	.030	200	59	9-32	150
55	.018	200			

Write for samples and prices

E. C. MITCHELL COMPANY

MIDDLETON 8 • MASS.

stepped up to meet the increasing defense demands for machine tools.

The officers of the parent company are Stanley M. Rowe, president; Stanley M. Rowe, Jr., vice president; and Edson A. Hoffman, secretary-treasurer. Harry W. Blackburn will continue as sales manager of The Sebastian Lathe Division.

Officers and Directors of Ex-Cell-O Elected

All members of the board of directors of Ex-Cell-O Corporation, including Phil Huber, Edward Andreae, Frank Andreae, R. W. Simonds, Leslie M. Johnston, H. G. Bixby, and J. K. Fulks, were reelected at the annual meeting of the shareholders of the corporation held at its main office in Detroit. At its regular meeting subsequent to the shareholders' meeting, the board of directors elected Mr. Huber, president and general manager of the corporation since 1937, to the newly created position of chairman of the board of directors. Mr. Bixby was elected to succeed Mr. Huber as president and general manager, while Mr. Fulks was elected to the newly created office of executive vice president. Mr. Bixby was previously vice president and treasurer and Mr. Fulks served as vice president in charge of manufacturing.

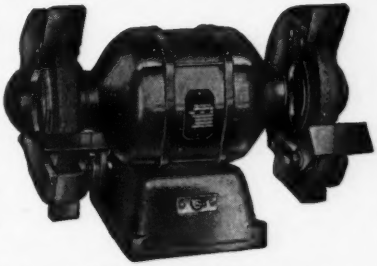
Milton B. Montgomery, whose most recent position was factory superintendent and general assistant to Mr. Fulks while he was vice president in charge of manufacturing, was chosen to succeed him in that position. Earl E. Conlin, previously secretary and assistant treasurer, was elected to the office of secretary and treasurer. Donald M. McPherson was reelected assistant secretary.

Baldor

PRECISION GRINDERS

for tool room or production work

Baldor's No. 8100 shown here is a ½ HP, 1700 RPM deluxe grinder for sharpening lathe tools, drills, taps, etc., and is also excellent for such production work as grinding off metal burrs, weld seams, etc. Close tolerance work is possible due to vibrationless operation of dynamically balanced armature.



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Grinders • Motors • Battery Chargers

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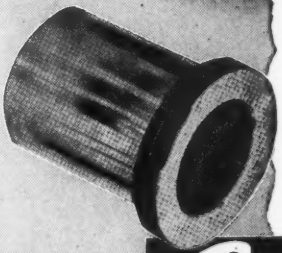
You're a Production Winner with Economy Drill-Jig Bushings and Gages



Yes, they're in stock, ready to go out to you — all A. S. A. standard types and sizes. You can also get fast service on new gages or gages salvaged by hard chromium plating . . . precision-finished, durable. Write for bulletin and price list.

Economy TOOL & MACHINE CO.

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E. B. McConville Elected Executive Vice President of Skilsaw

The election of Edwin B. McConville as executive vice president of Skilsaw, Inc., Chicago, Ill., manufacturer of portable power tools, has been announced by Bolton Sullivan, company president, who also reported the election of Paul Watts as vice president in charge of sales and Ralph B. Brundrett as treasurer of the company. Mr. McConville has been associated with Skilsaw since 1942. He was elected treasurer of the company in 1943 and was made a vice president in 1949. Before coming to Skilsaw, he was, for 20 years, a member of the firm of Finch, Van Slyck and McConville, wholesale merchants in St. Paul.

Edwin B. McConville

Mr. Watts, who has been in the portable power tool field since 1924, joined Skilsaw in 1940. He became a branch manager for the company in 1942 and took over as West Coast manager in 1946. He was made general sales manager of the corporation in 1949.

Mr. Brundrett, formerly vice president and treasurer of the Hamilton-Brown Shoe Company of St. Louis, joined the Skilsaw organization in 1945 as comptroller.

W. T. Hunter

William T. Hunter, retired president of A. Schrader's Son, Inc., Brooklyn 17, N. Y., manufacturer of pneumatic valves, and former vice president of

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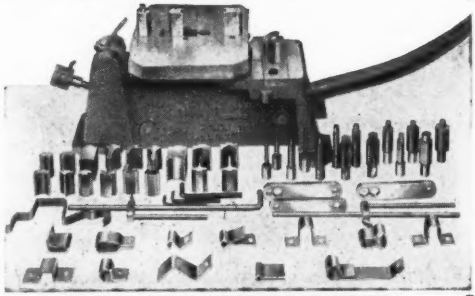
Bends — Cuts — Punches — Flats — Rounds Into Any Shape — Clamps — Brackets — Springs — Busbars — Wire Forms — Aircraft Work — Steel Rule Dies, Etc.



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• ACCURATE • VERSATILE
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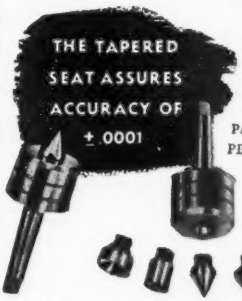
Manufactured in all tapers. 1 to 6 MT in stock. Special shanks and points made to order.



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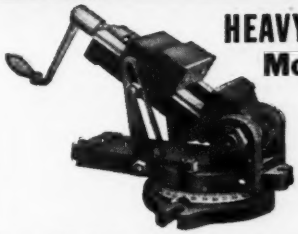
PALMGREN
ANGLE VISES



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For Quick — Accurate Set-ups

PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

Jaws are hardened and ground. Special outstanding features are the size and opening of jaws—4" Jaws open full 4", the 6" Jaws open full 6" etc., with corresponding depth of Jaws. Vise can be used as ordinary vise when lowered to horizontal position. Swivel bases furnished if desired. Sizes 4", 6" and 8" Jaws and openings. Prompt deliveries.

Write for bulletin on PALMGREN Vises.

ORDER TODAY Be Sure of Immediate Deliveries

CHICAGO TOOL & ENGINEERING CO.
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HAND-CUT STEEL STAMPS Letters & Figures

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Since 1849

HOGGSON & PETTIS MFG. CO., **New Haven, Conn.**

the Scovill Manufacturing Company, died recently at the age of 71. Mr. Hunter, who at his death was still a director of Scovill Manufacturing Company, retired on May 1, 1949. He had been with the Schrader concern for more than 50 years at the time.

In 1910, Mr. Hunter became secretary, assistant treasurer, and director of A. Schrader's Son, and, in 1922, in addition to these positions, he was made general manager of the firm. In 1924, he was elected vice president and general manager and in 1930, president and general manager. In 1935, Mr. Hunter was made vice president and director of Scovill Manufacturing Company in charge of the Schrader Division. On May 1, 1949, he retired as an officer of Scovill but remained as a director until his death.

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Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet & Plate Shops.

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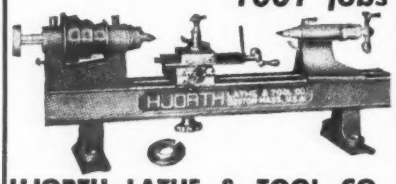

HJORTH LATHE & TOOL CO.
8 BEACON STREET WOBURN, MASS.

Military Men Study Products and Methods of Pratt & Whitney

Fifteen members of the Industrial College of the Armed Forces, one of several groups touring the nation to make first-hand studies of America's industrial strength, recently visited the Pratt & Whitney Division of Niles-Bement-Pond Co., West Hartford, Conn., which was selected because it was considered representative of the machine tool and gage industries in the Northeast. Of primary interest to the visitors were manufacturing facilities, plant operations, and discussions with company officials and plant executives regarding problems of normal operations and defense mobilization.

The Industrial College of the Armed Forces operates on the highest level of the military educational system and is located at Fort Lesley J. McNair,

SAVE ON PRODUCTION TOOLING COSTS with

CARDINAL -SPEED VISE-

The exclusive, quick-acting clamping mechanism of SPEED VISE accommodates a wide variety of parts.

A HUNDRED JIGS IN ONE

Drill jigs are simpler, smaller and cheaper when made for use in a SPEED VISE.

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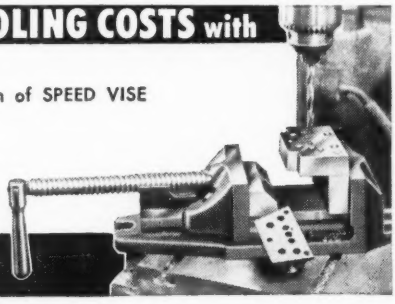

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STANDARD
TAPER PINS

The high quality and accuracy of Standard Steel Specialty Taper Pins have won them wide acceptance. Milled from bar stock, straight to taper and to extremely close tolerances, these pins give 100% performance. The uniformity and accuracy of the pins saves valuable time at assembly, assuring you trouble free service.

Write for complete catalog giving information on taper pins, Woodruff keys, machine keys and machine racks.

STANDARD STEEL SPECIALTY COMPANY

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PLANTS: BEAVER FALLS, PA. • HAMMOND, IND.

Over 85% of the torque wrenches used in industry are

STURTEVANT
TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
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- All Capacities

in inch ounces
...inch pounds
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(All sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

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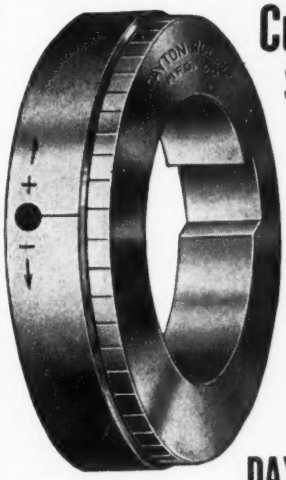
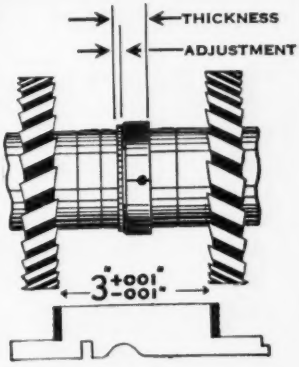
ACCURATE SPACING of Milling Machine Gang Cutters with Micrometer Adjustable Spacing Collars





Designed for accurate spacing of side milling cutters, gang milling and other multiple milling setups.

Collar may be adjusted by thousandths by merely loosening cutter arbor nut. Also quarter - thousandths adjustments.

WRITE FOR DETAILS

DAYTON ROGERS MFG. CO., MINNEAPOLIS, MINNESOTA

Members of the Industrial College of the Armed Forces and their host, Frederick U. Conrad, president of Niles-Bement-Pond Company (seated, center). One of several groups studying industrial facilities throughout the United States, this particular group is comprised of key personnel of the Army, Air Force, Navy, and Marine Corps, and certain qualified civilians.

Washington, D. C. It functions under the Joint Chiefs of Staff and serves to train key military personnel and qualified civilians for important command, staff, and planning assignments in many government agencies during

SINGLE ACTING

AIR-MITE

AIR CYLINDERS

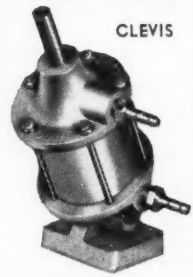
DOUBLE ACTING

CLEVIS

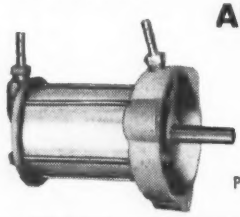
MICRO

SAVE time, spoilage, cost . . . speed production . . . reduce fatigue . . . on all drilling, reaming, tapping and processing jobs. Available in 1", 1½", 2¼", 3", 4" and 5" diameters; stroke length optional. Single or double action; all mountings.

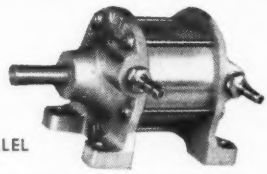
Write for complete catalog of Air Cylinders and Air Arbor Presses.



VERTICAL FACE

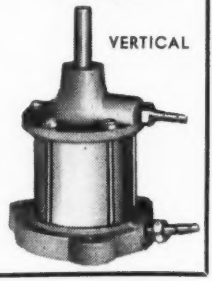


AIR-MITE 2651-G West Lake Chicago 12, Illinois



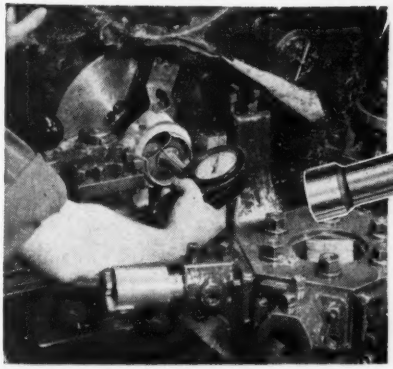
PARALLEL

VERTICAL



Get a higher percentage of acceptable work in producing PRECISION HOLES

Amazing improvements in volume of production and precision of holes are on record as a result of giving machine operators COMTORPLUG. This unique hand gage, enables operator to keep machine adjusted better. Automatically and positively assures correct gaging to fractions of .0001". Detects out-of-round, tapers, bell mouth, etc. COMPLETELY AND POSITIVELY ACCURATE IN HANDS OF RELATIVELY UNTRAINED PERSONS — AT MACHINE OR INSPECTION LINE. Applicable to work still in chuck if desired; shows actual size—just right for Statistical Quality Control. THE Answer to war conditions, involving great urgency, green help, rough handling of gages.



1/8" to 8" and larger

COMTORPLUG *gages bores to fractions of .0001"*

REQUEST BULLETIN 40

COMTOR CO. 64 FARWELL STREET WALTHAM 54, MASS.

For data on COMTORGAGE Precision External Gage, request Bulletin 30.

LESS *Work* MAKING SET-UPS

In making set-ups for tapping and reaming, it takes much less work and it takes far less time with a Ziegler holder than with an ordinary tool holder.

This becomes obvious when you consider that, when ordinary tool holders are used, extreme accuracy is required in the alignment of the work with the spindle. Not so, however, if you use a Ziegler holder! With a Ziegler, all you have to do is to come within 1/32" of perfect alignment and the holder automatically compensates for the difference—1/32" on the radius or 1/16" on the diameter.

Get a Ziegler holder and see how much time and work it will save you as compared with ordinary tool holders.

W. M. ZIEGLER TOOL CO.

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

13566 AUBURN DETROIT 23, MICH.

WRITE FOR CATALOG

both peace and war. This objective is accomplished through intensive study of all phases of our national economy, with special attention given to industrial mobilization and joint logistic planning.

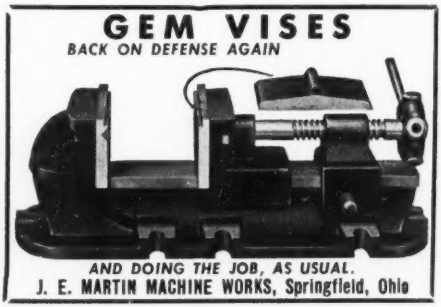
A comprehensive program was prepared for the visiting officials, including talks outlining Pratt & Whitney history and current operations, as well as guided tours through the various departments. Following the tours, the visitors attended brief lectures and exchanged ideas with P & W executives, engineers, and specialists.

J. H. Daum Joins Machine Tool Distributor as General Partner and Sales Manager

J. H. Daum has joined the Harrington-Wilson-Brown Company, New York City, machine tool distributor, as a general partner and sales manager. Well-known in machine tool industry, Mr. Daum was formerly executive vice president and general manager of The Cincinnati Planer Company which was purchased in July 1948 by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. He then went to Wisconsin as vice president in charge of sales when Giddings & Lewis moved The Cincinnati Planer Company operation from Cincinnati Ohio, to Fond du Lac.

John H. Daum

The principal accounts represented by the Harrington-Wilson-Brown Company are the Carlton Machine Tool Co., Cincinnati Shaper Co., and Lodge & Shipley Co. of Cincinnati, Ohio; Giddings & Lewis Machine Tool Co, Fond du Lac, Wis., including the Cincinnati Hypro line of machine tools; Barnes Drill Co. and Rehnberg-Jacobson Mfg. Co. of Rockford, Ill.; Clearing Machine Corp., Chicago, Ill; and Kaukauna Machine Corp., Kaukauna, Wisconsin.



USE THE RIGHT TOOL FOR THE JOB . . .

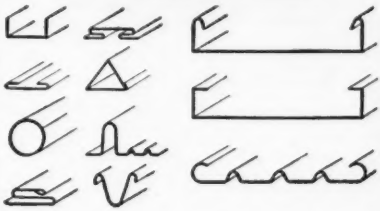
a BILLINGS* will do it better!

* CARBON STEEL DROP FORGED C-CLAMP

Ask your BILLINGS DISTRIBUTOR
He'll tell you why!

THE BILLINGS & SPENCER CO. HARTFORD 1, CONN. U.S.A.

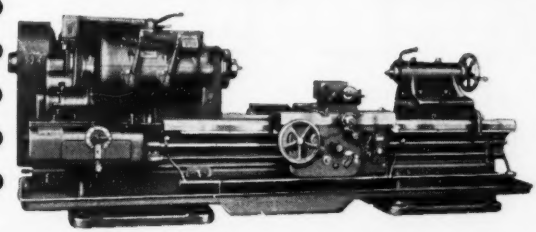
ROLL FORMING MACHINES AND ROLLER DIES



Also Pittsburgh Lock Machines, Pipe and Elbow, Beading, Turning Machines and all other Sheet Metal Working Machinery. Your inquiries invited.

MAPLEWOOD MACHINERY CO.
2636 Fullerton Ave. Chicago 47, Ill.

FOR 56 YEARS BUILDERS OF TOP QUALITY MACHINE TOOLS



BOYÉ & EMMES
in Cincinnati
Since 1895

Complete line of Heavy Duty lathes — sizes 14" through 32"

Boyé & Emmes are exclusive manufacturers of good, rugged, dependable lathes, which meet the requirements of precision operations throughout industry. Simplicity, ease of operation, power, rigidity, accuracy and long life are incorporated in our modern machine tools.

THE BOYÉ & EMMES MACHINE TOOL CO.
125 CALDWELL DRIVE • CINCINNATI, OHIO

Cleveland Automatic Machine Company Increases Board

The number of directors of the Cleveland Automatic Machine Co., Cincinnati 12, Ohio, has been increased from seven to nine with the election of A. F. Jelinek, chief engineer, and J. C. Maezer, factory manager. Mr. Jelinek has been employed by the company for 33 years and was promoted to the position of chief engineer in 1944. Mr. Maezer came to the company in 1929 and became factory manager in 1945.

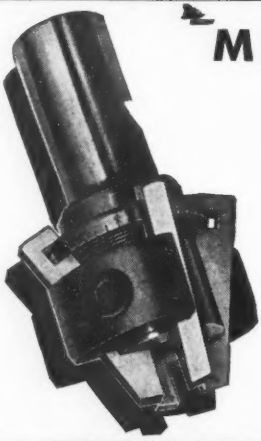
Other members of the board of directors of the company are as follows: Harold R. LeBlond, president and chairman of board; Richard K. LeBlond, (founder of R. K. LeBlond Machine Tool Co.); Richard E. LeBlond, vice president; Nicholas Peay, vice president; John Prohaska, vice president; Edward G. Schultz, treasurer; and Frank Stenger, secretary.

Curtis Franklin Elected Board Chairman of Automatic Steel Products

At a recent meeting, Curtis Franklin was elected chairman of the board of directors of Automatic Steel Products, Inc., Canton, Ohio. Mr. Franklin has been secretary, treasurer, and director of the company and is also president and director of British Type Investors, Inc., and of the Allied International Investing Corporation. He holds the offices of secretary, treasurer, and director of The Cleveland Tapping Machine Company and of the Rams-Head Company.

Curtis Franklin

KUTMORE ADJUSTABLE HOLLOW MILLS



MACHINING COSTS REDUCED

- ANY COMBINATION OF . . . TURNING . . . TAPERING . . . FACING . . . CHAMFERING . . . TREPANNING IN **ONE PASS.**
- EXCLUSIVE **MICROMETER** ADJUSTMENT FEATURE FOR RAPID SET-UP.
- CUTTING CAPACITIES FROM 1/32" TO 2" DIAMETER IN STANDARD STOCK.

WRITE FOR CATALOGUE No. 20 MM

OUR ENGINEERING DEPARTMENT IS AT YOUR DISPOSAL ON YOUR HOLLOW MILL PROBLEMS

CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5, N. Y.

WRITE FOR OUR
BIG NEW 1951
"TOOLMAKER'S" GUIDE

MR. "MONTY"

Meet Mr. "Monty," the tool detective, with hundreds of Cost-Cutting Production-Increasing "Stock" Devices

ASK ABOUT MR. "MONTY'S"
FREE 10-DAY
TRIAL PLAN

MONTGOMERY & CO., INC.
SINCE 1876

Dept. M4, 53 Park Place, New York 7, N. Y.

GAMMONS
REAMERS

Manufacturers of
The Gammons Helical Taper Pin Reamer
The Gammons Helical Chucking Reamer
The Gammons Helical Die Makers Reamer
The Gammons Duplex Taper Pin Reamer
Special reaming problems invited
Send for Catalog

THE GAMMONS-HOAGLUND CO.
MANCHESTER CONNECTICUT

Buy
KIPP AIR GRINDERS
Because

The RPM's stay up while grinding ... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work — longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
30,000 R. P. M.
$42.00
IN U. S. A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

MADISON-KIPP CORP.
208 Waubesa St., Madison, Wis., U.S.A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

Did You Know?---

The National Tool Co., Cleveland, Ohio, has announced the appointment of **Austin Ford Logan,** 115 W. Chippewa St., Buffalo 2, N. Y., as agent for western New York State. Mr. Logan, who is a member of the A. S. T. E., A. S. M., and A. W. S., has been active in the sale and distribution of products in the industry for 15 years.

Ralph J. Kraut, president, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has announced that **Albert S. Puelicher,** president of the Marshall & Ilsley Bank, Milwaukee, has been appointed a director to fill the unexpired term of John H. Daum, resigned.

—o—

J. C. L. Brown has been appointed sales manager of the machinery division of the Gardner Machine Co., Beloit, Wis., manufacturer of disc grinders and abrasives. Mr. Brown was formerly associated with the Landis Tool Company for 21 years where he was in charge of distributor sales for United States and Canada.

—o—

Ralph O. Anderson, Norton Company district manager in St. Louis, Missouri, has been appointed by the National Production Authority to serve in its Machinery Division as abrasive consultant. **Gwynn L. Parrott,** abrasive engineer in Illinois, has replaced Mr. Anderson as St. Louis district manager.

Grinding Valve Stems and Faces

HOW THE CORRECT CUTTING FLUID MULTIPLIED GRINDING WHEEL LIFE 8 TIMES!

THE table below shows the outstanding results which can often be secured simply by asking D. A. Stuart Oil Co. to investigate your cutting fluid requirements:

	BEFORE	AFTER
GRINDING FLUID	SOLUBLE OIL "X"	STUART'S SUPERKOOL 81X GRINDING OIL
Material	Steel Forgings Rc 30-36	Steel Forgings Rc 30-36
Stock Removal — Valve Face	Rough & Finish Grind .014" in TWO passes	Rough & Finish Grind .014" in ONE pass
Stock Removal — Stem	.004" - .006" in TWO passes	.004" - .006" in ONE pass
Average Production Per Wheel Dressing	Stem — 350-400 Face — 300-350	Stem — 2000 Face — 1200
Total Wheel Life	One Week	Eight Weeks

Write for literature and ask to have a D. A. Stuart Representative call.

D.A. Stuart Oil CO.

2741-47 S. Troy Street, Chicago 23, Ill.

Did You Know?---

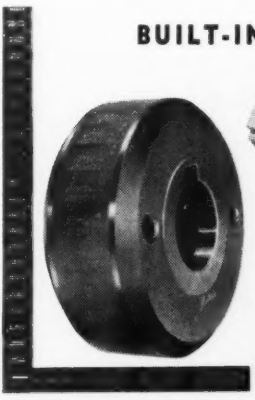
Ralph W. Rausch has been appointed consulting engineer of Link-Belt Company, manufacturer of materials handling and power transmission machinery. His headquarters will continue to be at the Pershing Road plant, Chicago, of which he became assistant chief engineer in 1933 and chief engineer in 1947. **Joseph J. Richard,** heretofore executive assistant chief engineer of the Pershing Road plant, has been appointed chief engineer of this plant to succeed Mr. Rausch.

—o—

Two Waldes Truarc Retaining Ring distributors and one representative have announced removal to larger quarters. **Ehret and Kinsey,** Chicago representative, will occupy new offices at 141 W. Jackson Blvd. **Bobker Bearings,** New York and New Jersey distributor, has taken new space at 282 7th Ave., New York City. **Bearings Service and Supply,** distributor, has moved its Denver location to 1850 Market St.

The appointment of **Charles R. Schmitt** as manager of the lubrication sales department has been announced by E. F. Houghton & Co., Philadelphia, Pa., manufacturer of industrial lubricants, metal and textile processing products, and leathers. Mr. Schmitt, was transferred to the company's main office in Philadelphia from Cleveland.

BUILT-IN MARKING DIE



Flexibility

WITH PARKER'S INTERCHANGEABLE SEGMENT ROLL MARKING DIE

- One roll marking die to tackle the exacting job of marking thousands of carpenter's squares. Clear accurate lettering was just as sharp for the 1000th impression as for the first. Individual segments can be removed, changed or replaced in seconds. One Parker Roll Die does the job of dozens of solid roll dies.
- The *flexibility* of Parker's Patented Taper Lock roll marking dies is solving difficult marking problems — saving down-time — saving money — every hour, every day for cost-conscious progressive manufacturers. This is but one of the exclusive Parker marking dies.
- For a better mark on *your* product, faster, cleaner, and at less production cost — investigate the *flexibility* of Parker's facilities. From stock marking numbers to specially engineered marking devices. Mechanical engraving and embossing. Parker marking dies for steel, brass, aluminum, plastic or wood.

SEND FOR THE *PARKER BLUE BOOK*

Steel Stamps, Marking Dies, Coining Dies, Embossing Dies, Mechanical Engraving and Special Marking Projects. Be sure to have the *Parker Blue Book* in your file.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

Did You Know?---

The Abrasive and Diamond Wheel Department of Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J., has announced that **Kenneth A. Tamms** has joined its staff as sales engineer for Wisconsin. Mr. Tamms, previously assistant purchasing agent for Ampco Metal, Inc., succeeds Alex Watchorn.

The Chicago district sales offices for **Cincinnati Milling and Grinding Machines, Incorporated,** and **Cincinnati Milling Products Division** have been moved to larger quarters at 104 Park Ave., Oak Park, Ill. The new office, managed by Carl F. Stugard, will provide ample room for both field service and field engineers. Products sold and serviced by the machine tool division include machines for milling, broaching, diesinking, grinding, lapping, cutter sharpening, and flame hardening. The Milling Products Division handles grinding wheels and Cimcool cutting fluid.

— o —

The Hardinge Co., Inc., New York, N. Y., owner of Hardinge Mfg. Co., York, Pa., has entered into a contract with the Meehanite Metal Corp., New Rochelle, N. Y., to produce Meehanite castings in its foundry at York, Pennsylvania. The company is a prominent manufacturer of heavy duty equipment for the mining industry and is well known for its line of products in the machinery field.

Countless users of open back inclinable presses can now have the advantages of Verson press design in economical units suitable for a wide variety of stamping jobs. Such features as the allsteel frame . . machine cut steel gear and pinion . . . split cap main and crankpin bearings . . . mechanically interlocked type pneumatic friction clutch and brake unit . . . and many others are all incorporated into the Verson O.B.I. line. Six models, rated in maximum capacity at 90, 105, 125, 150, 210 and 250 tons respectively, are now available

Bulletin OBI-49 gives design details and specifications. Write for a copy, today.

VERSON ALLSTEEL PRESS CO.

9310 South Kenwood Avenue Holmes St. and Ledbetter Drive
CHICAGO 19, ILLINOIS DALLAS 8, TEXAS

THERE S A VERSON PRESS FOR EVERY JOB FROM 15 TONS UP!

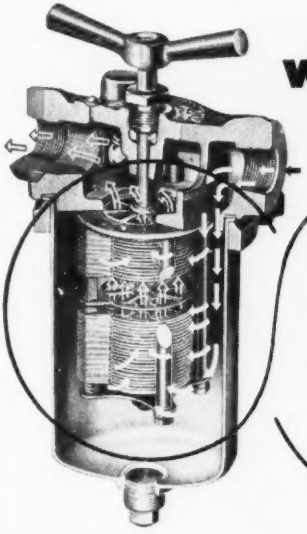
Did You Know?---

J. Arthur Deakin and Son has moved to a newly enlarged showroom and office at 150-28 Hillside Ave., Jamaica 2, N. Y. This company, national representative for the English firm of George H. Alexander Machinery, Limited, and its subsidiary, Precision Grinding, Limited, will display Alexander's diesinking and engraving machines and cutter grinders and Precision Grinding's line of precision optical measuring equipment for the metal-working industry.

—o—

A. Ian Brown of A. G. & A. L. Brown Co., 4932 Sherbrooke St., W., Montreal, Quebec, Canada, has been appointed as representative in the provinces of Quebec and Montreal by the Boice - Crane Co., Toledo, Ohio. As representative for Boice-Crane, Mr. Brown will have charge in his teritory of the distribution of the company's table saws, jointers, band saws, drill presses, contour saws, lathes, sanders, planers, scroll saws, and tool grinders.

Robert D. Lawson, formerly Chicago district manager for Norton Company's grinding machine division, has been named sales manager of the division, replacing C. Denson Day who has resigned to accept a position with Machinery Associates, Incorporated, Philadelphia. **Wilfred R. Ogg,** formerly New England sales representative for Norton grinding machines, succeeds Mr. Lawson as Chicago district manager.



WHAT FLUID STRAINER

is non-stopping (A)
and
is permanent (B)
and
handles full flow (C)
and
guarantees performance (D) ?

A. Cuno AUTO-KLEAN is continuously-cleanable, manually or automatically, without stopping flow

B. Cuno AUTO-KLEAN is all-metal, disc-type, non-collapsible

C. Cuno AUTO-KLEAN can handle full flow—a few to more than 4000 gpm—in same space as usual partial-flow type

D. Cuno AUTO-KLEAN will remove all particles larger than specified—from .0035 in. to .062 in.

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

Widely used on lubricating, hydraulic and fuel oils, water, and all industrial fluids.

For free booklet on fluid straining, address Cuno Engineering Corp., 185 South Vine Street, Meriden, Connecticut.

Did You Know?---

A. R. Wise, vice president of The Cleveland Tapping Machine Co., Canton, Ohio, a subsidiary of Automatic Steel Products, Inc., has announced the appointment of the following dealers: **McVoy-Hausman Co.,** 2024 Sixth Ave., N., Birmingham, Ala., for Alabama, Georgia, and part of Florida; **Charles W. Stone Co.,** 1019 Marquette Ave., Minneapolis, Minn., for Minnesota, western Wisconsin, North Dakota, and South Dakota; **John S. Young Co., Ltd.,** 257-261 Eglinton St., Glasgow C5, as exclusive representative in Scotland.

— o —

At a meeting of the stockholders of Automatic Steel Products, Inc., Canton, Ohio, **Ralph Henderson Everett** was elected a director for a term of three years. Mr. Everett was associated with Keystone Varnish Co., Brooklyn, N. Y., from 1916 to 1943, serving as secretary from 1923, and, since 1943, has been with M. J. Merkin Paint Co., New York City and Lyndhurst, N. J., as executive vice president.

— o —

The New York district office of The Cleveland Automatic Machine Company was moved recently from Newark, N. J., to Room 210 Ruskin Bldg., 75 S. Orange Ave., South Orange, N. J. **R. T. Carroll** is district manager and **Charles Locey** is service engineer for this district.

LIVE CENTER

CARRIES HEAVY LOADS AT HIGH SPEEDS

by SJ SCULLY-JONES

You get accurate, safe, low-cost turning operations with the Scully-Jones Live Center... simple in design... thoroughly tested... proven in actual shop use.

(A) CARRY HEAVY LOADS AT HIGH SPEEDS ACCURATELY—SAFELY
Two matched, standard, precision Timken tapered roller bearings, aligned for accuracy and anti-friction rotation, provide large bearing surface to take shock loads and abuse.

(B) GET RIGID SET-UP THROUGH QUICK ADJUSTMENT
Threaded retainer ring preloads bearings and provides adjustment for wear — assures a rigid set-up.

(C) PERFORM ACCURATE WORK —ELIMINATE REJECTS
Spindle is of alloy steel hardened to 64 Rockwell "C". Point ground in own bearings. Threaded hole for fast redressing of point. Shank is induction-hardened; precision ground.

(D) GET LONG LIFE— LOW MAINTENANCE
Heavy-duty grease seal is incorporated in threaded retainer ring.

(E) SAVE TIME GREASING —REDRESSING
Grease port, for standard grease fitting. Through this port a threaded rod is inserted to rotate spindle when redressing point with a tool post grinder.

STOCK DELIVERY ON NOS. 2, 3, 4 and 5 MORSE TAPER SIZES

SEND for Bulletin containing Prices and Specifications

Scully-Jones AND COMPANY
1907 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

4073 MTBBR

Did You Know?---

Bruce A. Dean, formerly general sales manager of the Mengel Co., Inc., Louisville, Ky., has been elected vice president in charge of sales for Chase Brass & Copper Co., Inc., Waterbury, Connecticut.

Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y., has been appointed exclusive U. S. representative for Thommen, S. A., Waldenburg, Switzerland, manufacturer of thread rolling machines and precision thread rolling dies.

—o—

J. Douglas Dawson, traffic manager of the Abrasive Division of Norton Co., Worcester, Mass., has been appointed general traffic manager, succeeding **Elmer B. Jones,** who has retired.

—o—

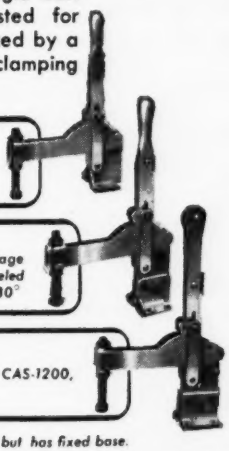
The appointment of **John F. Scott** as tubular products division manager of the general sales department of United States Steel Supply Co., Chicago, Ill., has been announced by Paul C. Van Cleave, sales vice president.

Chain Belt Company of Milwaukee has announced the election of **L. B. McKnight** to the newly created position of executive vice president. Mr. McKnight, who has served in various managerial capacities since joining the company in 1927, is currently president of the National Association of Conveyor Equipment Manufacturers and is also a member of the Conveyor Industry Advisory Committee to the National Production Authority.

Announcing

NEW CAM CLAMPS

These cam-action clamps were designed for applications where parts (such as castings, larger forgings, or stacked stampings) having variable thickness, are to be held. They are the only big cam clamps known that provide convenient means for locating the spindle assembly along the toggle bar. The spindle itself is easily adjusted for clamping height, and can be replaced by a special pressure pad to suit other clamping requirements.



MODEL CAV-1200
Recommended force at end of toggle bar: 1200 lbs. Recommended force 3⅛" from front of base, 1900 lbs.

MODEL CAS-1200
This clamp has the additional advantage of permitting the toggle bar to be swiveled around the base to any position within 180°

MODEL CAS-2000
This clamp has the same features as Model CAS-1200, but for 2000 lbs. clamping force.

MODEL CAV-2000—*similar to above but has fixed base.*

This entire series is also available without cam action (with fixed locking). Catalogued as Models V-1200, S-1200, V-2000, and S-2000. Complete catalog sent on request.

KNU-VISE PRODUCTS **LAPEER MFG. CO.**

3048 DAVISON ROAD • LAPEER, MICHIGAN

Western Division, 422 Magnolia St., Glendale, Calif.

Did You Know?---

The Reading Chain & Block Corp., Reading, Pa., has changed its name to **Reading Crane & Hoist Corporation.** The change of name does not affect the capital structure, personnel ownership, or production of the company, but is merely more descriptive of the company's operation which, up to 1918, was devoted principally to the production of chain and chain blocks, but since that time chiefly to cranes and electric hoists.

— o —

E. R. Almdale has been appointed manager of the Michigan district for Carboloy Company, Incorporated, Detroit. Mr. Almdale, who has held various engineering and sales positions with the company, will assume the position recently vacated by **P. J. Jensen,** who has been called back to duty in the Detroit ordnance district with the rank of lieutenant-colonel.

— o —

At a recent meeting of the board of directors, **John P. Kelsey** was elected an assistant treasurer of Sharon Steel Corp., Sharon, Pennsylvania.

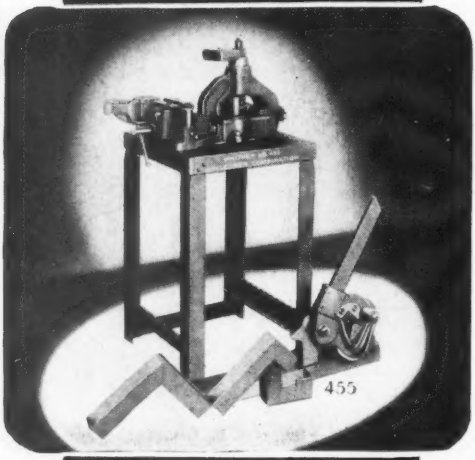
— o —

The **Sixth National Instrument Conference and Exhibit,** sponsored by the Instrument Society of America, 921 Ridge Ave., Pittsburgh 12 Pa., will be held in the Sam Houston Coliseum, Houston, Texas, from September 10 through 14, 1951.

— o —

According to an announcement by G. L. Bachner, president, **D. K. McIlvaine** has been appointed to the staff of the Powdered Metal Products Corporation of America as manager of the company's Electronics Division. Mr. McIlvaine, who before joining the Powdered Metal Products Corporation was associated with the Bell Telephone Laboratories and Western Electric, will be located in the offices of the corporation at 9335 W. Belmont Ave., Franklin Park, Illinois.

WHITNEY METAL
TOOL COMPANY
39 YEARS EXPERIENCE



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No. 455
ANGLE IRON COMBINATION
An unusually strong and compact unit for shearing, notching, and bending angle iron. Adaptable for on-the-job work or permanent mounting in the shop. Floor space required — 21-1/2" x 26".
Capacity — all sizes angle iron up to and including 2" x 2" x 1/4"
Send for descriptive catalog.

WHITNEY METAL TOOL CO.
110 FORBES ST., ROCKFORD, ILL.

Did You Know?---

Two changes in the field sales staff of The Monarch Machine Tool Co., Sidney, Ohio, have been announced by Stanley A. Brandenburg, sales vice president of the company. **Donald J. Harshbarger,** working out of Monarch's New York sales office for the past three years, has been transferred to the company's Pittsburgh branch office, 512 Empire Building, where he will report to W. B. Craig, district manager. **Harry C. Hennequin,** who joined Monarch last December, will take over Mr. Harshbarger's duties in the company's New York office, reporting to Fred J. Griffis, district manager. Mr. Brandenburg has also announced the appointment of **Willis H. Kuhlman** to the newly-created post of supervisor of Monarch Mona-Matic lathe sales and the appointment of **Sailor E. Beer,** associated with the company in a variety of special sales capacities, as distributor sales manager.

Kennametal Inc., Latrobe, Pa., manufacturer of cemented carbide tools, has announced the appointment of **Gordon Kimball** as application engineer in the Kennametal district office at 1537 Main St., Springfield, Mass. **F. O. Hill** has been transferred from the Cincinnati office to serve as application engineer in the district office at 2443 Prospect Ave., Cleveland, Ohio.

THE TRUMBULL ELECTRIC HAS INCREASED PRODUCTION OF THESE COPPER CONTACTS FROM 200 OR LESS TO OVER 12,000 PER GRIND - - -

Here are the facts:—Four men now produce more contacts than seven men produced originally. More contacts are slotted with one shift than with *three* shifts previously. Considerable assembly time is saved because of increased slotting accuracy. Rejects are virtually non-existent — an important item, especially when milling hard-to-get copper.
Find out how NELCO Carbide Tipped Tools can *speed production* and *save dollars* for you. Don't delay, contact a NELCO Distributor Today!

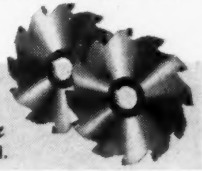
PRODUCTION RECORD —

HIGH SPEED STEEL CUTTER — from 30 to 200 pieces per grind.

NELCO CARBIDE CUTTER — from 6,000 to 13,000 pieces per grind.

A normal increase from 300 slotted contacts per day to over 1,200 per day.

WRITE FOR CATALOG "CARBIDE TOOLS," TODAY!



NELCO TOOLS

For that Extra Edge in Production

NELCO TOOL CO. INC. • MANCHESTER, CONN.

Did You Know?---

The Diamond Machine Tool Co., Los Angeles, Calif., manufacturer of precision metal-working machinery, has appointed **Gene Heller** to direct the sales and advertising of the company. Mr. Heller was a former partner of the Heller Machinery Company and previous to that was with the Pacific Machinery Company.

RECLINABLE
POWER PRESSES

Ideal for general stamping work . . . 4 to 100 tons capacity. Can recline to 40° with perfect safety.

Our catalog contains a wide variety of press types and sizes. Write for it today.

*46th year serving worldwide industry with Patent Percussion, Open Back, Double Crank, Punch, Horn, and Toggle and Straight Side Presses, Dial and Roll Feeds.

ZEH & HAHNEMANN CO.
190 VANDERPOOL ST., NEWARK 5, N. J.

Sidney B. Wetherhead, previously covering Maine, New Hampshire, and Vermont for the Norton Co., Worcester, Mass., has been assigned to the eastern Massachusetts territory to assist Raymond J. Forkey, abrasive engineer in that area. **Charles A. Babbitt,** formerly serving North Carolina and Virginia, has taken over the Maine, New Hampshire, and Vermont territory and will operate under the direction of Fred W. Elya, northeastern district manager. **Richard D. Burdette** has been appointed abrasive engineer to succeed Mr. Babbitt in the North Carolina and Virginia area and will work under the direction of Leroy K. Behr, district manager.

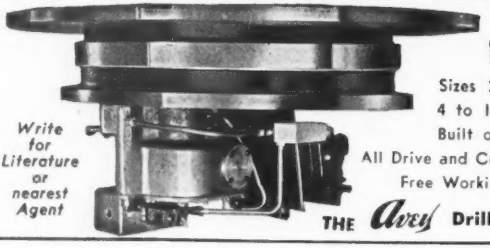
— o —

Richard J. Brown has been appointed advertising and sales promotion manager of the Delta Power Tool Division of Rockwell Manufacturing Company, with headquarters in Milwaukee. Mr. Brown was previously director of advertising and sales promotion for the Crane Packing Company of Chicago.

— o —

To assist industry in meeting rigid metal finish specifications economically, the Industrial Products Division, **Elgin National Watch Co.,** Elgin, Ill., has announced the availability of field trained representatives for detailed study of fine finishing problems.

Avey **AUTOMATIC INDEX TABLE** ***Meets Demand for DRILLING and TAPPING EQUIPMENT***



Sizes 24", 30", 36" Tables Interchangeable. 4 to 18 Indexes. Entire Unit Self-Contained. Built on Unit Construction Principle. All Drive and Control Mechanisms underneath Table for Free Working Surface • Easy Accessibility!

Write for Literature or nearest Agent

THE *Avey* **Drilling Machine Co.,** Cincinnati 1, Ohio

Did You Know?---

The Whiton Machine Co., New London, Conn., manufacturer of lathe chucks and centering machines, has announced the appointment of the following companies to handle the sale of its products in their respective areas: **Port Huron Equipment Co.,** 2222 Lapeer Ave., Port Huron, Mich.; **Melson Industrial Supply Co.,** 604 Bridge, N. W., Grand Rapids, Mich.; **Olsen-Sansom & Co.,** 6432 Cass Ave., Detroit, Mich.; and **Sterling Products Co.,** 1524 3rd Ave., Moline, Illinois.

— o —

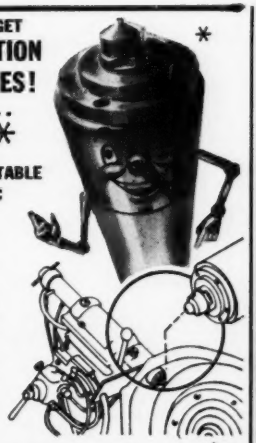
The Ohio Crankshaft Co., Cleveland, Ohio, has announced the relocation of its Detroit office at 530 W. 8 Mile Rd., Detroit 20, Mich. The office has been expanded to include complete engineering, sales, and service facilities covering all phases of induction heating. Manager of the Detroit district is **W. K. Ginman.**

— o —

The Sagimco Engineering Corp., 34 Avenue des Champs Elysees, Paris, France, has been licensed as sales associate of the Topflight Tape Co., York, Pa. The Sagimco firm is primarily concerned with the introduction of printed pressure-sensitive identification tape to French industry, particularly in the aircraft field.

Morse G. Dial has been elected executive vice president of Union Carbide Corp., New York, N. Y. Since 1949, Mr. Dial has been director, vice president, and treasurer of the corporation. **Dr. George O. Curme, Jr.,** has been elected vice president in charge of research and will now head all of the research activities of Union Carbide. Since 1948 he has been vice president in charge of chemical research.

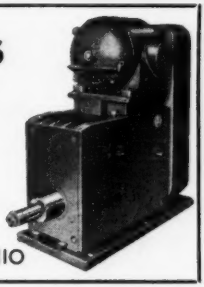
HERE'S HOW TO GET
HIGH PRODUCTION
MICRO FINISHES!
Equip with . . .
CITCO*
AUTOMATIC, ADJUSTABLE
HYDRAULIC
DIAMOND
TURNER
More pieces per dress! Eliminates human error! AVAILABLE FOR Cincinnati Centerless, landis Camamatic, I. W. and Heald Internal Grinders. Write, Phone, Wire!



FOR PRECISION WORK—INSIST UPON CITCO "SOLID COPPER" DIAMOND TOOLS!
Fast re-setting & re-lapping service. Special attention to Defense Contract problems.

Cleveland Industrial Tool Corp.
1080 East 222nd St., • Cleveland 17, Ohio

Avey AUTOMATIC UNITS
for DRILLING • TAPPING
REAMING • HOLLOW MILLING and DEEP HOLE DRILLING
Vertical, Horizontal or Angular Mounting.
Made in two sizes . . . No. 1 & No. 2 Morse Taper.
Here's a packaged unit . . . that will simplify your
HIGH PRODUCTION PROBLEMS. Write for details.
THE Avey DRILLING MACHINE CO., CINCINNATI 1, OHIO



Did You Know?---

Charles H. Besly and Company, manufacturer of taps, drills, and reamers, has opened a new warehouse and sales office at 6516 Detroit Ave., Cleveland 2, Ohio, under the direction of T. F. Mummery, Jr. This branch, which will carry a large stock of Besly products, will provide faster service to Besly customers and distributors on cutting tools for the manufacturers of civilian and military goods. Additional large stocks of taps, drills, and reamers are carried in Chicago and at the plant in Beloit, Wisconsin.

—o—

Crobalt, Inc., Ann Arbor, Mich., has announced the appointment of five new distributors for Crobalt cast-alloy cutting tools. These distributors and their territories are as follows: **H. G. Bissell,** 116 N. Mound St., Lebanon, Ohio—southern Ohio, southern Indiana, and northern Kentucky; **MacInnes Steel Sales Co.,** 502 Marine Bank Bldg., Erie, Pa.—northwestern Pennsylvania and western New York; **Eugene Roth, Inc.,** 250 W. 57th St., New York 19, N. Y.—New England and greater New York; **H. J. Scheid & Co.,** 18 W. Chelten Bldg., Philadelphia 44, Pa.—southeastern Pennsylvania, Delaware, Maryland, and southern New Jersey; **United Industries Co.,** 3131 Cherry Ave., Long Beach 7, Calif.—southern California.

—o—

S. C. Lawson, general sales manager of Ampco Metal, Inc., Milwaukee 46, Wis., has announced the appointment of **Louis C. Begg** as district manager of the newly established Buffalo sales division. Mr. Begg was transferred from the Ampco main office in Milwaukee where he has been serving the company as special sales engineer.

Has only to be resharpened by grinding top face.

The boring tools are made of super-high-speed steel or carbide tipped.

BORING TOOLS

WITH *EXTRA* ADVANTAGES!

All styles

- for general boring
- for bottoming and facing
- for internal threading

Write for catalog

R.B.TOOL Co., Inc.

41 East Hartsdale Ave
Hartsdale, N.Y.

Did You Know?---

Arcos Corp., Philadelphia, Pa., welding electrode manufacturer, has announced the transfer of **J. R. Collins** to the newly-opened sales office in Chicago, Illinois. Mr. Collins has been sales representative in the Philadelphia territory since 1946.

— o —

Charles Kuhn, oldest active employee of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., with 57 years of service as a sales representative in the company's New York sales office, retired recently.

— o —

L. W. Mercer has been elected executive vice president of the Square D Co., Detroit, Mich. **F. H. Roby** has been elected vice president in charge of sales and director, while **L. G. Maechtlen** has been elected vice president and director.

— o —

At a recent board of directors meeting, **Stanley F. Krzeszewski** was elected a vice president of American Wheelabrator and Equipment Corp., Mishawaka, Ind. For the past 5½ years he has been factory manager and will continue with these duties.

— o —

Roy A. Hunt, president of Aluminum Company of America, Pittsburgh, since 1928, was named chairman of the executive committee and **I. W. Wilson,** senior vice president, was made president of the company at a meeting of Alcoa's board of directors. **Arthur V. Davis** continues as chairman of the board. The board also elected **Leon E. Hickman,** senior partner of the Pittsburgh law firm Smith, Buchanan & Ingersoll, as vice president and general counsel of the company.

BRADFORD TOOLS

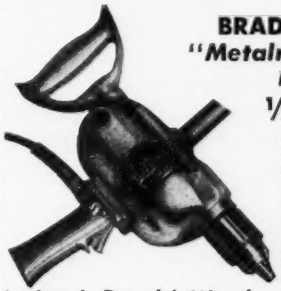
• DO A BETTER JOB

• ARE A BETTER BUY

More and more shops are finding that Bradford Electric Tools do *better* work, and stay on the job *longer*. That's because Bradford Tools are designed and constructed to meet today's work requirements with labor-saving efficiency.

NEW BRADFORD 6" AERIAL GRINDER

For easy, accurate grinding, wire brushing or polishing all classes of work—from ornamental iron to heavy "I" beams. Tool has excellent balance. Powerful motor develops 1 hp.; has no-load speed of 4000 r.p.m. Ball bearing construction. Equipped with one 6" x 1" x ⅝" hole general purpose wheel. Length, 25"; weight, 17 lbs.



BRADFORD "Metalmaster" MODEL 49 ½" DRILL

Fine balance, light weight and streamlined design make the "Metalmaster" Model 49 the most popular ½" drill. Drills ½" in steel; 1" in hardwood. Powerful 110 volt universal motor. Armature, spindle and gear shafts supported by ball bearings with sealed-in lubrication. Jacobs chuck. Net weight only 10¼ lbs.

• • •

ASK your tool supplier to demonstrate these precision Bradford Tools. Write for full information on the complete line of Bradford Portable Drills, Saws, Sanders, Polishers; Bench and Pedestal Grinders, Buffers.

THE BRADFORD MACHINE TOOL CO.

658 Evans St. **Cincinnati, Ohio**

Precision Since 1840

Book Reviews

Servomechanisms and Regulating System Design, Volume I. By Harold Chestnut and Robert W. Mayer. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. 505 pages. Cloth binding, board covers. Price, $7.75.

This volume presents the feedback control problem with the object of training design and application engineers. It starts from the basic mathematics, describes clearly the nature of the physical problems involved, and proceeds to the solution of advanced designs. The book emphasizes feedback control concept for regulators and servomechanisms. The nomenclature and symbols recommended by the A.I.E.E. Feedback Control Committee have been used throughout the book, which also presents both the differential equation and Laplace transform methods of solving transient problems. The importance of stability is stressed and many typical systems are illustrated.

Moreover, this volume emphasizes attenuation concept for use in regulators as well as servomechanisms. The analysis and synthesis of the type of multiple loop and multiple input systems encountered in practice are discussed from the attenuation point of view. The book stresses the practical approach to system synthesis; dynamic as well as static error coefficients are presented. Also provided are charts indicating the nature of design characteristics necessary to obtain desirable steady-state and transient responses, as well as numerous problems illustrating and extending the text material.

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Live Centers

• HEAVY DUTY
• LONG LIFE
• HIGH SPEED

MARVECO is the time-tested live center with unlimited capacity—50 pounds to 50 tons . . . guaranteed to outperform and outlast any other live center. You can depend on MARVECO for trouble-free production.

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SEND US YOUR CENTER PROBLEMS

MARVEL TOOL & MACHINE CO.
1096 North River Road • St. Clair, Michigan

HIGH-SPEED Cold Riveters

Thousands of now happy users originally started with us by submitting sample assemblies of their riveting work. Our complete line of riveters gave us a choice for the best economy and results. Without charge we studied their particular problem, and returned the assembly properly riveted with complete analysis, recommendations and quotations.
It's a FREE service, that may save you time, materials and spoilage—and speedup production. Why not write us?
We also manufacture High Speed Drilling Machine, Model R53 for sensitive, precise and accurate drilling.

See our ad on Staking Machines at right.

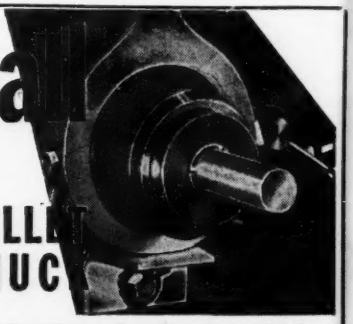
HIGH SPEED Hammer Co., Inc.
307 Norton St.
Rochester 21, N.Y.

Metal Processing. Second Edition. By Orlan William Boston. Published by John Wiley & Sons, Inc., 440—4th Ave., New York 16, N. Y. 763 pages. Illustrated. Cloth binding, board covers. Price, $7.50.

In this completely revised volume, the author provides detailed information on machine processes, accessories, and tools and illustrates the correlation between design, metals, and manufacturing of a product. The steps involved in designing for production are covered in the first chapter. Subsequent chapters treat the various classes of machines and the processes and factors with which they are involved.

The book is designed to provide all the information needed for the complete preparation of routings, including the selection of machine tools, the cutting tool materials, tool shapes, power, speeds, and feeds, and all accessories involved in the plant layout and manufacture. It emphasizes the nomenclature of tools and techniques employed in their operation and covers a wide range of practical applications of modern tools and methods. Moreover, the book discusses the development of the design of a product, including materials, analyses and forms, fits, tolerances, surface quality, and so on. Engineering specifications and standards are provided, together with pertinent reading references for those interested in more detailed study. Some 590 helpful illustrations, charts, and diagrams are employed to illustrate the text.

Employee Feeding. By John W. Stokes. Published by Edmund S. Whitten, Inc., 216 Tremont St., Boston 16,



SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007—without adjustments...no bearings, friction, heat or loss of power. Instant release without stopping lathe.

2-inch capacity, $145; *3-inch capacity,* $295; *1-inch capacity,* $95

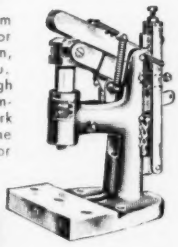
Round, square or hex collets, plain—serrated

HALL MANUFACTURING COMPANY
622 Tularosa Dr., Dept. B, Los Angeles 26

HIGH-SPEED Staking Machines

Is YOUR problem DIFFERENT? We have met and solved thousands of such problems—from cameras and meters to toys and electrical items. Anything for staking or riveting fixed or movable joints—anything in eyeletting, grommeting, burring, pointing with platinum, tungsten, silver—whatever your problem, we can help you. WHY?—HOW? Simply accumulated experience, plus best high speed machinery built. Safe, simple—uniform, adjustable hammer blow—foot or air operation. Dual action feature holds work firm, rigid. Cuts costs amazingly—assembles, stakes, in one operation even with slight thickness variations. Prove it for yourself. No obligation. Write us.

See our ad on Cold Riveters at left.

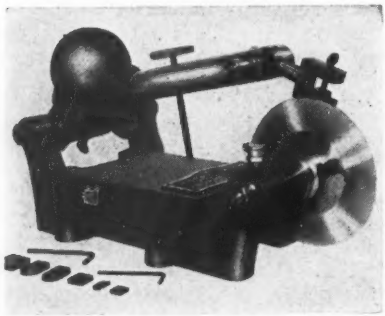


HIGH SPEED Hammer Co., Inc. 307 Norton St. Rochester 21, N.Y.

Carbide Users

CAN NOW RESTORE BROKEN TOOLS AND CUTTERS QUICKLY AND INEXPENSIVELY WITH THE NEW IMPROVED MODEL No. 300

UNION CUT-OFF MACHINE



WHAT IT DOES:
Cuts broken sections off damaged carbide tools without grinding.
Cuts standard carbide blanks to any desired size.
Saves time-consuming grinding on carbide tools.
Saves carbide tools that otherwise would be scrapped.
Saves you money on costly diamond grinding wheels.
Saves you money by making possible the purchase of large-size standard carbide blanks.
Simple to operate and automatic in operation.

SPECIFICATIONS:
¼ H.P. motor, 1725 R.P.M. 110 Volt. Overall size 7" x 12" x 8" high. Supplied complete with diamond cutoff blade and motor for $275.00 F.O.B. Stamford, Connecticut.

LITERATURE ON REQUEST

UNION
WIRE DIE CORP.

71 W. 45TH ST. N. Y. 19, N. Y. **PLANT: STAMFORD, CONN.**

Mass. 92 pages. Heavy paper covers. Price, $3.00.

Arranged to be of service to top executives and cafeteria managers alike, this manual covers policies and procedures for setting up and operating an efficient employee feeding facility in industrial plants, institutions, and so on. The material, it is claimed, may be applied to defense and wartime emergency feeding requirements, as well as ordinary peacetime conditions.

The main sections of the manual are headed as follows: The Food Organization; Location; Equipment; Purchasing; Receiving; Storage; Food Preparation; Cooking; Menu-making; Sanitation; Food Cost Control; Labor Cost Control; Accounting Records and Statements; Food Trucks and Other Services; Developing Patronage and Sales Volume; Care of Equipment; and Preventive Maintenance. The manual includes 27 charts, floor plans, and typical forms, as well as other supplementary material which is said to make it a practical guide in day to day operations or when orienting new cafeteria employees to their duties.

Welding, Joining, and Cutting of Gray Iron. By Charles O. Burgess. Published by Gray Iron Founders' Society, Inc., 210 National City-E. 6th Bldg., Cleveland 14, Ohio. 40 pages. Price per copy, $1.00 to Society members; $1.50 to non-members. (Discounts on larger quantities).

The second of a series of three technical manuals on gray iron castings to be published by the Gray Iron Founders' Society, this book describes new processes and improved techniques for successfully welding gray iron. According to the author, the new processes described in the manual

make it possible to extend all of the advantages of welded fabrication to gray iron components.

Written in plain language, the subject matter covers gas, arc, inert-gas, braze-weld, brazing, thermit, flash welding, and other operations.

Sound Slidefilm Guide. 5th Edition. Published by Operadio Mfg. Co., St. Charles, Ill. 64 pages. Heavy paper covers. Price, $1.00.

Devoted exclusively to sound slidefilms, this guide, which provides a comprehensive listing of over 1,000 available sound slidefilms, features an alphabetical title index, a complete list of over 150 sources from where the films may be obtained, and a descriptive commentary on each film. It indicates whether the film is available for sale, rental, or free loan and gives the prices or rental costs.

The sound slidefilms described cover many subjects, including industrial relations, labor, supervision, personnel, foremen, industrial training, automobiles, sales, automobile repair, agriculture, aviation, electricity, electronics, measurements, railroads, refrigeration, welding, industrial safety, eye protection, materials handling, safety management, tool safety, teaching, education, and many other subjects.

New Shop Equipment

Hydraulic Metalworking Press Has Pipeless Circuit Construction

The development of a hydraulic metalworking press of pipeless circuit construction has been announced by Elmes Engineering Division, American Steel Foundries, 1171 Tennesse Ave., Cincinnati 29, Ohio. The only pipes in the entire press are the pilot, suction, and drain lines and of these only the pilot line carries high pressure. All high pressure fluid is conducted through short direct passages drilled in the structural parts. As a result, there are no high pressure screwed joints to loosen, no oil drippage from loosened joints, and no possibility of welded joints breaking loose, the manufacturer states.

The pumping unit can be removed as a unit assembly without disconnecting any piping. The valve unit, located in the oil reservoir, is also removable as a unit assembly. To minimize noise of operation, the reversing type hydraulic pump is supported in a heavy cast steel bracket flange-mounted to the press cylinder. The

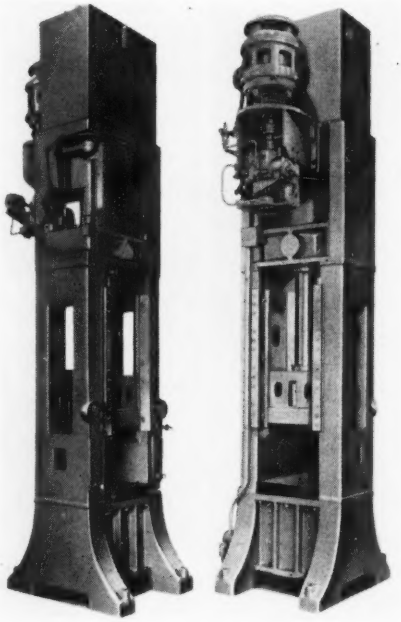
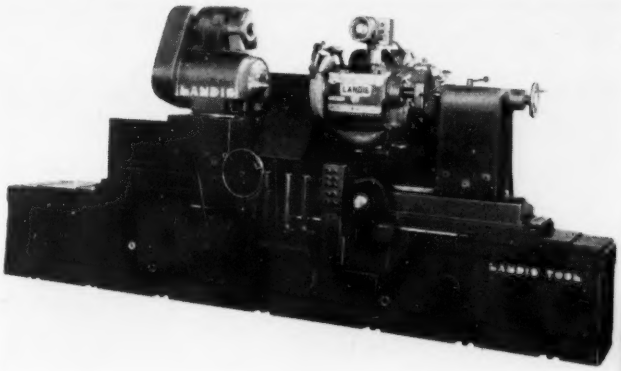


Illustration showing front and rear views of Elmes Drawing and Forming Press with pipeless circuit construction. Cutaway section in front view shows area around cylinder barrel.

Landis Tool Type CHW Universal Grinder



pipeless valve unit contains all necessary provisions for prefilling during rapid advance, changing to pressing speed by either pressure or position, and decompression prior to reversal. This unit is designed in a wide range of sizes for application to many different speeds and tonnages. In extreme cases, multiple units are used.

Additional features claimed for the press include push-button control, press and stroke reversal, no hesitation of platen on position slowdown, and smooth and shockless operation.

Universal Grinder Designed for Large Diameter Workpieces

A universal grinder for large diameter workpieces has been developed by Landis Tool Co., Waynesboro, Pa. Identified as the Type CHW, the grinder is available in sizes to swing 30, 36, and 48-inch diameter work. Lengths between centers are 48, 72, 96, and 120 inches.

Parts such as turbine shafts, large diameter motor armatures, large water valves, track carriers, and similar parts are said to be ideal for production with the Type CHW which is a fully universal precision grinder with built-in provision for swiveling the wheelbase, headstock, and work table. Wheelbase travel permits grinding a full range of diameters from zero to maximum capacity. An 18-inch diameter grinding wheel with 2-inch face is standard equipment. The grinding wheel spindle operates in Microsphere bearings and is driven direct from the 7½ h.p. wheel drive motor. A grinding wheel may also be carried on the right-hand end of the spindle. An internal grinding fixture may be attached to the front of the wheelbase. Work speeds are infinitely adjustable from 8 to 96 r.p.m. A 3 h.p. d.c. motor is used for the work drive. The headstock may be swiveled 90 degrees for face grinding operations.

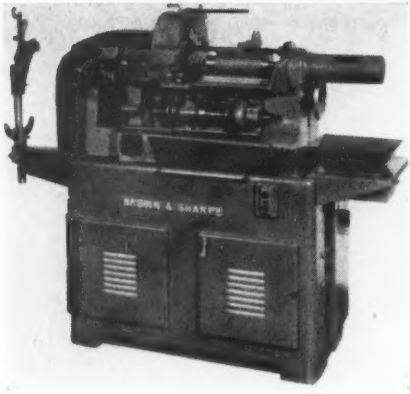
Dual controls are available so that the machine may be operated either from the front or from the rear, depending on the shape of the workpiece. Carriage ways are extra wide to provide stability when grinding large diameter work. The hydraulic traverse is adjustable to any desired speed between 3 and 130 inches per minute. The swivel table is adjustable for grinding tapered workpieces. Reservoirs for coolant, hydraulic oil and lubricating oil are provided in the bed casting. Electrical motors and controls are raised to permit easy servicing of these parts.

This machine is also available as a plain grinder for single purpose high production operations.

Automatic Cutting-Off Machine Particularly Useful for Manufacture of Roller Bearings and Similar Parts

An automatic cutting-off machine of the opposed spindle type which is said to be particularly useful for the manufacturer of roller bearings and work of a similar nature has been announced by Brown & Sharpe Mfg. Co., Providence 1, R. I. The machine has a maximum capacity for work up to ⅜ inch in diameter. The feeding mechanism is designed to feed any length up to 1 inch in a single movement and greater lengths to 4½ inches by successive movements. A feed tube of ½-inch capacity for light to medium work and lining tubes for the opposed spindle for $\frac{3}{32}$ to $\frac{3}{16}$-inch diameter stock can be furnished on order.

The machine is driven by a 2 h.p. constant-speed motor mounted on an adjustable bracket on the base of the machine under the tank table and enclosed by louvered guards. The driving motor is



Brown & Sharpe Opposed Spindle Type Automatic Cutting-Off Machine

started and stopped through a push-button station built into the front of the fabricated steel base. The work spindle is mounted on precision anti-friction bearings at the front and rear, operating in boxes which are supported in the bed of the machine. Sixteen spindle speeds ranging from 5,000 to 454 r.p.m. are provided.

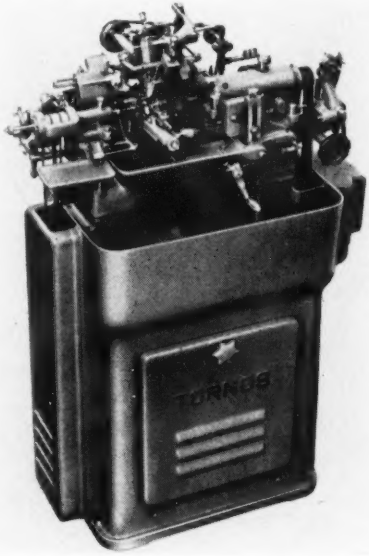
The opposed spindle is driven in the same direction and at the same speed as the work spindle and is mounted on precision anti-friction bearings supported in a bracket on the bed of the machine. The spindle is advanced and withdrawn from gripping position by a cam that is made from a steel disc, easily formed, and quickly applied to a shaft at the right end of the machine. Actuation of the collet and feeding mechanism is controlled by dogs on a carrier mounted on the cross-slide camshaft at the front of the machine. The cross-slide camshaft and the shaft at the right of the machine for the opposed spindle cam are driven in unison through change gears from a driving shaft at the rear. Gears furnished provide rates of production from ¾ to 45½ seconds for one piece per cycle of cams.

The machine is equipped with an automatic oiling arrangement which provides force feed lubrication to the most important points of the machine. The base unit is of fabricated steel and provides rigid support for the one-piece cast bed. The coolant system comprises a chain-driven geared pump with pressure relief valve which provides an ample flow of oil from a reservoir in the base unit.

Swiss Automatic Produces Small Precision Screws

A Swiss automatic screw machine specifically designed for the high speed production of very small precision screws is being distributed by Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y. Identified as the Tornos Type TV, the machine has a capacity for work up to ⅝ inch in diameter x 1 inch long and is furnished complete with single spindle threading attachment, slotting attachment, and safety device. By means of multiple cams, screws of different sizes can be produced without changing the tooling and without loss of production time.

To eliminate difficulties in threading small screws by means of the overlapping process, a headstock spindle stopping device is available which is designed to reduce the speed of the threading spindle to actual threading speed so that no inertia is developed and accurate cutting of threads up to the head of the screw can be effected. The spindle stopping device consists of a friction clutch which is controlled by adjustable cams and can be set at any time during the cycle of the camshaft. A safety stopping device is said to stop the machine if threading or slotting operations are interrupted.



Tornos Type TV Automatic Screw Machine

STOP Tap Breakage INCREASE Production

EXCLUSIVE! **"Tru-Grip" Tap Holder**

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

. . . . . With the New PROCUNIER High Speed Tapping Head

Industry has long appreciated the many exclusive features and advantages found only in Procunier Tapping Machines. Precision built for faster, more accurate tapping, they have consistently proven their superiority on high-speed production runs. For more than 30 years they have been giving the tapping industry dependable service, insuring cleaner, sharper threads —with fewer broken taps, fewer spoiled pieces.

HERE'S WHY:

1. *Tap breakage is practically eliminated* due to high sensitivity of the new Procunier cork-faced friction clutch which automatially regulates driving pressure. Dull taps require more driving power than sharp ones . . . thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch—thereby avoiding needless tap breakage.
2. *Strain and wear are minimized* and tortion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation—*avoiding tap wobble.*
4. *Aluminum housings* assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping. PLUS many other exclusive features.

WRITE TODAY

for full details and specifications on the complete line of Procunier Tapping Machines and see why Procunier offers the "finest in tapping equipment."

Procunier

Safety Chuck Company

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Procunier Safety Chuck Co., Dept. 6,
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Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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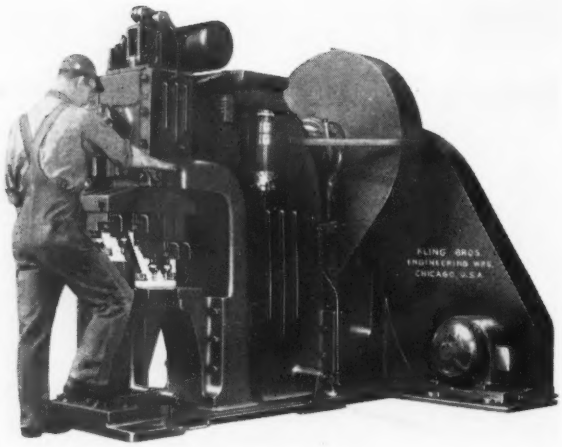


Kling No. 7 Universal Punch

Open End Punch Accommodates I-Beams up to 30 Inches

Product of Kling Bros. Engineering Works, 1328 N. Kostner Ave., Chicago 51, Ill., the Kling No. 7 Universal Punch illustrated herewith has a rating of 118 tons, weighs 18,000 lb., and, without motor, occupies a floor space of 118 x 36 inches. A 7½ h.p. motor drives the flywheel through V-belts. The machine has a capacity for punching a 1¼-inch hole through 1-inch material in the center of the ram and a 1⅞-inch hole through ¾-inch material at 10½ inches from the center of the ram.

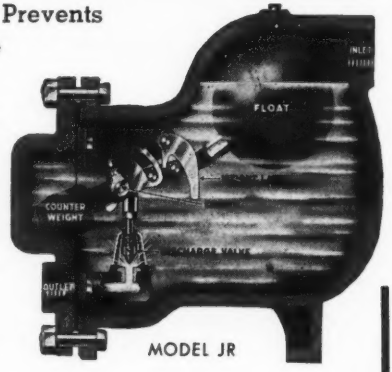
The punch is furnished complete with three high die blocks, two low die blocks, and two gooseneck die blocks. This die block equipment is said to enable the operator to punch the flanges and webs of beams and channels from 3 to 30 inches. In most cases, the web and flange punching can be performed without changing setups. H-beams, I-beams, angles, and other structural shapes can be handled by the punch which, due to its open throat, also permits plates of any size within the capacity of the machine to be punched.

Nicholson Bulletin 651 Describes New

NON-PLUG AIR TRAPS

New Oil-Eliminating Feature Prevents Build-Up of Scum and Sludge

In this Nicholson air trap you enjoy the advantages of the positive intermittent action of a float-operated air trap without the common problem of oil congealing on the mechanism and impeding or stopping its action. Three types; pressures to 1500 lbs. See other Nicholson features in Bulletin 651.



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Steam & Air Traps . Control Valves . Expan. Mandrels . Arbor Presses . Welded Floats

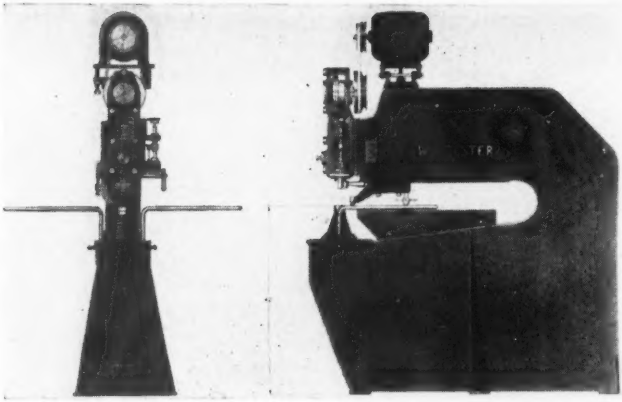
A *better* Lathe from any *angle*.

By whatever standards you measure a lathe—bearings[1], capacity[2], gearing[3], apron[4], bed[5], power to spindle[6], accuracy[7]—whatever is important to *you*, you will find it completely satisfied in a SHELDON lathe.

(1) "Zero Precision" Tapered Roller Bearings—the best Timkens on *any* lathe. (2) Large collet capacity with Choice of Center Distance. (3) Hobcut gears throughout for smooth operation. (4) Modern full double wall apron. (5) Bed has an engineered backbone. (6) Two V-belts to spindle for greater pulling power. (7) Holds precise accuracy for years.

SHELDON
CHICAGO

SHELDON MACHINE CO., Inc., 4250 North Knox Ave., Chicago 41, Ill.



"Worcester" Nibbling Machine

Two-Speed Drive Is Feature of Nibbling Machine

Product of Arduini Mfg. Corp., 435 Shrewsbury St., Worcester 4, Mass., the "Worcester" Nibbling Machine illustrated herewith features a two-speed drive and variable stroke adjustment to accommodate different thicknesses of metal. Straight or contour cutting is said to be accomplished at the rate of 1,200 punch strokes per minute with the machine, which may also be used to cut circles quickly and accurately. The machine is claimed to produce unusually clean edges, thus reducing finishing operations to a minimum, and is also said to eliminate distortion of the material being cut.

Of steel frame construction to ensure maximum rigidity, the nibbler is made in two sizes, one of which is designed to handle up to $\frac{5}{16}$-inch low carbon steel and the other up to $\frac{3}{16}$-inch low carbon steel.

Safety "PAYS OFF" in Extra PRODUCTION

with "ALL AMERICAN"
SAFE - SWEEP Press Guards

Designed by specialists in safety equipment to give operator utmost freedom and protection. Quick-Mounting Type Sweeps that fit any press. Pivot Slot Action. Sweep starts or stops at any point. Meets all safety standards. Write for Sweep Bulletin.

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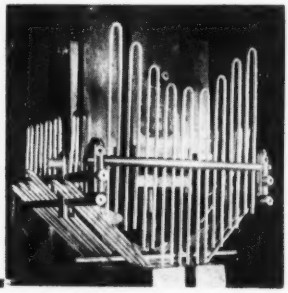

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Four Socket Screws controlling all bars (type pictured or square type, with or without set screws). Maximum flexibility to meet all conditions.

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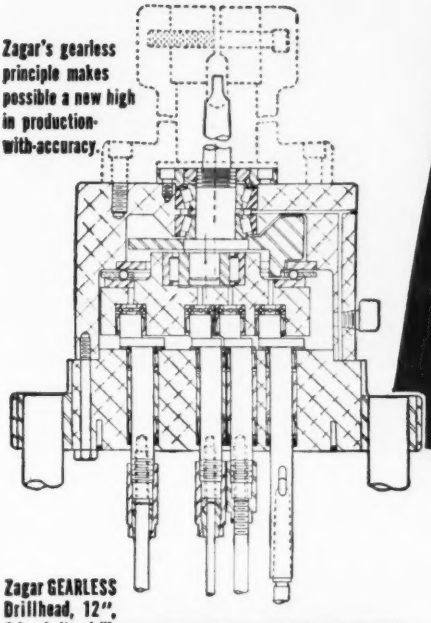
Zagar's gearless principle makes possible a new high in production-with-accuracy.

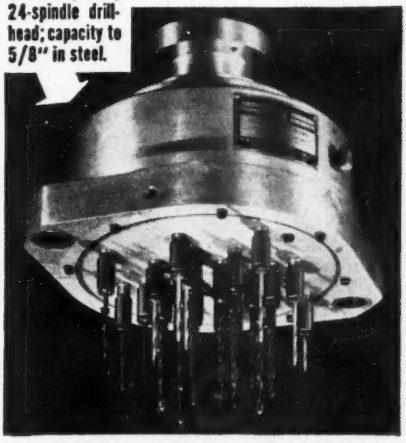


HOLES for sale

ANY NUMBER
ANY PATTERN

PROMPT DELIVERIES

Zagar GEARLESS Drillhead, 12", 24-spindle drillhead; capacity to 5/8" in steel.



For sale: low-priced holes, yet perfect and highly profitable! Drill many hundreds of holes at one pass — any number of spindles — any material (steel, glass, plastics, acoustical tile, etc.)—any pattern—as close as twice drill diameter. Adaptable to any standard drill press or designed as complete unit. A new high in production, a new low in cost. Send your part drawing for quick quotation.

★ ★

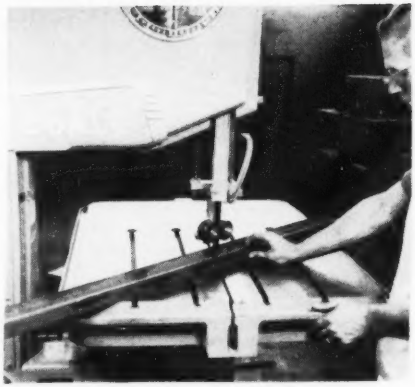
ZAGAR TOOL, INC., 24000 Lakeland Blvd., Cleveland 23, Ohio

Ask for Catalog S-6.

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Angle Saw Guide Blocks Increase Sawing Capacity

The DoAll Co., Des Plaines, Ill., has announced the availability of angle saw guides which are said to adapt all models of the company's machines for contour machining and high speed or friction band sawing to cutoff work of any length. The angle guide blocks are claimed to add to the vertical band saw's versatility by overcoming the work length limitation imposed by the machine's throat capacity. For example, a 36-inch throat machine with standard guides can cut off a piece of stock only 36 inches long. However,



DoAll Band Saw equipped with 30-degree angle guide blocks can be used to cut off work of any length.

with 30-degree angle saw guides there is no limit to the length of extrusions or bar stock that can be handled and, with these guides, a piece of stock as large as 15 inches in diameter can be cut off square or at any desired angle and with no limitation on the length of the piece to be cut, it is claimed.

For DoAll Utility models and the standard Contour machines with tool speeds of 50 to 1,500 f.p.m., 30-degree angle insert type guide blocks are available. For the Zephyr high speed band saws, 30-degree insert type and 45-degree angle roller type guide blocks can be furnished. For the DoAll Contour-matic, the hydraulically operated machine for all types of band machining with speeds ranging from 40 to 10,000 f.p.m., three types of angle guides are available: 30-degree insert type guides for blades up to ½-inch width, 35-degree roller type guides for high speed operation with blades up to 1 inch wide, and 45-degree insert type

RUGGED

"NIROL" LIVE CENTERS permit perfect support of all loads and thrusts. Reduced overhang adds rigidity and increases machine capacity. Compensating factor provided for work expansion from heat while machining.

Write for complete details.

NIROL MFG. CO.
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NORTH PLAINFIELD, N. J.

- ***Faster Machining***
- ***No Scored Centers***
- ***Remarkable Accuracy***

Patent Applied for

Combine

BURRING • CLEANING
FINISHING • POLISHING

into one time-saving precision operation in the production of defense and civilian

PRODUCTS, PARTS, ASSEMBLIES

in all metals, plastics, glass, wood

WHAT HAPPENS WHEN BRIGHTBOY ABRASIVE AND *RUBBER* WORK TOGETHER:

A unique surfacing-smoothing action. It is burring-finishing-cleaning-polishing all in one. It cuts down production steps; can save up to fifty per cent in time. The rubber "cushions" the abrasive, facilitating the smoothing and finishing of even lightest-weight and semi-precious metals, as well as plastics, glass, wood, laminated and molded products. Brightboy's versatility and adaptability transcend the scope of conventional abrasives.

HOW BRIGHTBOY SAVES PRODUCTION TIME

1. Bridges the gap between the rough grind and the buff.
2. Works to close tolerances: can be shaped to contour.
3. Produces a wide variety of conventional and special finishes and patterns; frequently the final polish.
4. Requires no before-use preparation or dressing; no skilled labor to handle it.

SOME BRIGHTBOY GENERAL-USES

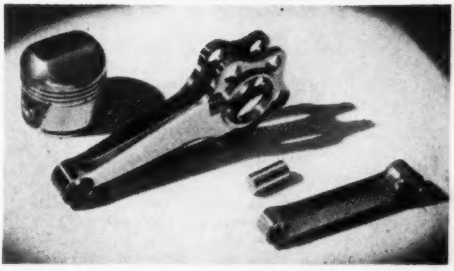
- Removing light digs, tool and heat marks.
- Cleaning welded and soldered joints.
- Finishing dies and molds.
- Burring and finishing stampings, castings, machined and molded parts.

BRIGHTBOY IS ALREADY-PROVED FOR DEFENSE-PRODUCTS MANUFACTURE AND MAINTENANCE

ORDNANCE • AIRPLANE PARTS • INTERNAL COMBUSTION & JET ENGINES • ELECTRICAL & ELECTRONIC EQUIPMENT • TRANSPORTATION EQUIPMENT • INSTRUMENTS, and for the production of basic tools, dies, molds, jigs, patterns, etc.

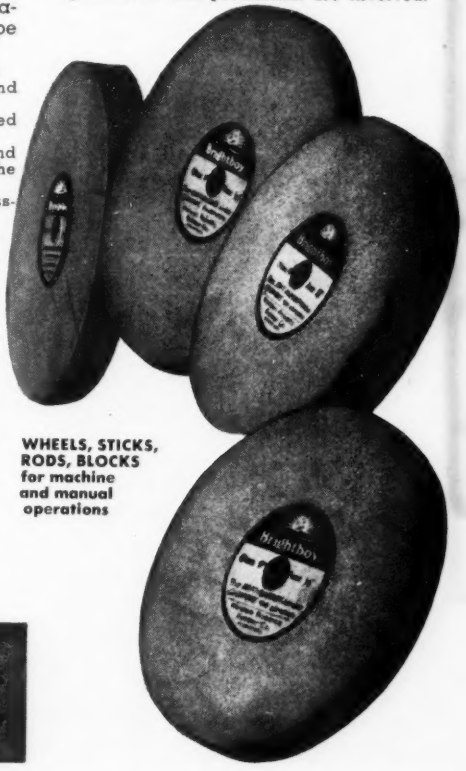
BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
6th Ave. & No. 13th St., Newark 7, N. J.
America's Pioneer Manufacturers of Rubber-Bonded Abrasives

WELDON ROBERTS
Brightboy



Brightboy-finished cylinder dome, connecting rod, wrist pin and link rod—internal combustion engine.

Ask your dealer NOW about Brightboy—and for the Brightboy Catalog Manual containing work data and time-saving suggestions. Write the Brightboy Service Department on any problem where light finishing and precision surfacing methods and production are involved.



WHEELS, STICKS, RODS, BLOCKS for machine and manual operations

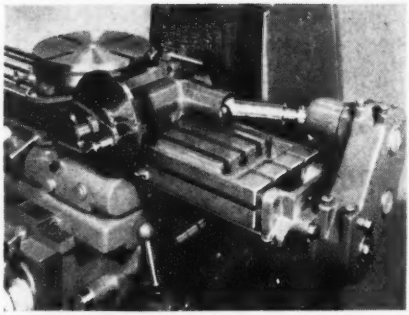
guides for use with ⅝, ¾, or 1-inch wide blades at conventional metal sawing speeds.

Circular Milling Attachment Available in Manual and Power Feed Styles

A circular or rotary milling attachment for use with its smaller knee-type milling machines has been announced by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. The unit is intended primarily for toolroom work; however, when properly tooled up, it is said to become an efficient high production unit for milling operations on small parts.

The attachment is built in two styles; namely, manual feed and power feed. For both styles, the table is 12 inches in diameter; machined with four standard ⅜-inch T-slots; rotated through a worm and wheel having an 80 to 1 ratio; and graduated in degrees on its circumference. The handwheel dial is graduated in minutes.

The power feed attachment is driven by the machine on which it is mounted. A shaft located beneath the table and parallel to the feed screw drives a gear train within a bracket attached to the right end of the table. Power is transmitted from the gear train to the attachment by a universal joined telescoping shaft. A reverse clutch arrangement permits the table to be driven clockwise or counterclockwise or disengaged for manual rotary adjustment. Both the manual and power driven styles may be equipped with an auxiliary indexing attachment which employs the same index plate as standard Cincinnati dividing heads.



Cincinnati 12-Inch Power Feed Circular Milling Attachment equipped with auxiliary indexing attachment

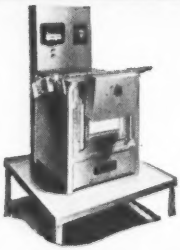
COOLEY HEAT TREATING FURNACES

ELECTRIC BOX TYPE · FLOOR AND BENCH MODELS

For Tools and Small Parts

SHOWN HERE

THE COOLEY BENCH MODEL
for HARDENING AND TEMPERING



Max. Temp.	Sizes	Price
1850°	8″ x 6″ x 14″ 10″ x 6″ x 18″ 10″ x 8″ x 18″	$220 to $425
2000°	8″ x 6″ x 14″	

All prices are less controls. Any standard controls available for automatic temperature control.

- Available with hinged or vertical lift door.
- Heating elements fully protected from mechanical or atmospheric destruction.

Brown and Wheelco Control Pyrometers carried in stock—available for all applications.

Free on request: ☐ COMPLETE CATALOG ☐ "SHOP NOTES ON HEAT TREATING"

COOLEY ELECTRIC MANUFACTURING CORP.
34 SO. SHELBY · INDIANAPOLIS, IND.

Save Time, Money . . . Speed Production

with the NEW *revolutionary* HARDING TOOL ADAPTOR

for MILLING MACHINES
BORING MILLS
RADIAL DRILLS
LATHE TURRETS

Hydraulic Ejector Button

Designed and developed by experienced tool engineers, the HARDING ROTARY ADAPTOR fills a long felt need for changing taper shank tools without removing the adaptor from spindle.

Adaptor comes equipped with Hydraulic Tool Ejector. Tools are removed by lightly tapping the release plunger. Reduces tool changing time from minutes to seconds.

Write today for FULL DETAILS

GREENVILLE TOOL & DIE COMPANY
1033 S. LAFAYETTE ROAD **GREENVILLE, MICHIGAN**

For Simplicity in

OIL GROOVING!

The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc.

This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

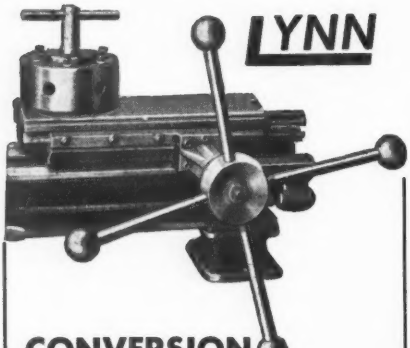
Write for Catalog.

Send parts for free grooving and production estimate

Fischer Machine Co.

Established 1900

316 N. ELEVENTH ST. — PHILADELPHIA 7, PA.



CONVERSION TURRETS
& CUT OFF CROSS SLIDES

Fast Delivery

Especially adapted for the following lathes:

Logan	**Craftsman**
Atlas	**Power Craft**
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Large Turrets to Order

Convert your engine lathes for turret work. Put your idle or unproductive lathes into full-capacity production — *At Once.* **Lynn** conversion turrets are easily and quickly mounted on your present lathes—all set and ready for full-capacity, close-tolerance production, just like new turret lathes, but at a small fraction of the cost.

Machine Tool Division

LYNN

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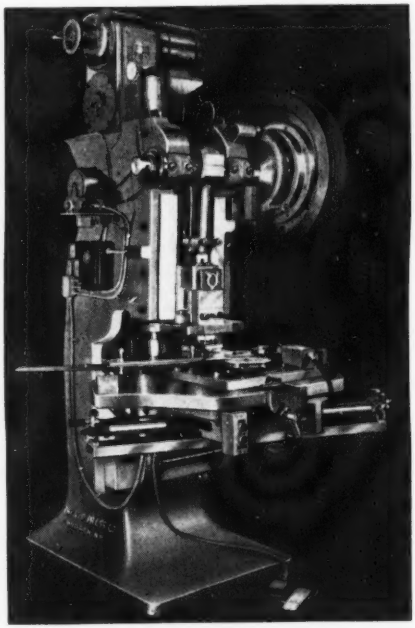
MANUFACTURING CO., Inc.
1121 So. Seventh St., Minneapolis, Minn.

Press Designed for Notching Larger Sizes of Segment Laminations

The V & O Press Co., Hudson, N. Y., has developed a segmental notching press for the notching of rotor or stator segments of the larger sizes. Said to have a capacity for segments from 24 inches in diameter up to those of a straight-line type, the machine which is provided with a simple air-operated arrangement, is



V & O Segmental Notching Press

claimed to be easy to tool-up and maintain for the various number of notches required.

In use, the operator places the segment blank in position on the work-holding fixture and steps on a foot switch. The segment then automatically moves into notching position against a stop, which immediately starts the press and enables the prescribed notching operation to be performed. At the end of the cycle, a micro switch action provides for stopping of the press and return of the notched segment to its original position for removal.

WHITNEY
No. 91
Bench Punch

A very efficient and satisfactory tool for general use, shop or experimental room.

Depth of throat — 5 inches.

Capacity — ½ thru ¼ or 2 thru ⅛".

Notches angles 1½ x 1½ x ⅛.

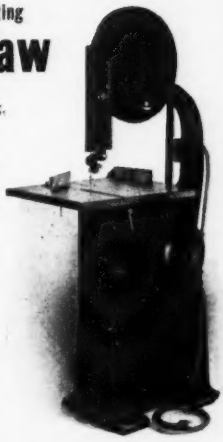
Punches supplied in rounds, squares, ovals, rectangles or specials.

Write for catalogue.

W. A. Whitney Mfg. Co.

640 Race St. Rockford, Ill.

"OLIVER"
18-In. Metal Cutting
Band Saw



For sawing tubing, small rods, sheet metals, woods, hard rubber, compositions.

High speed motor or with low speed geared head motor direct connected to lower wheel.

Cuts straight, circles, curves.

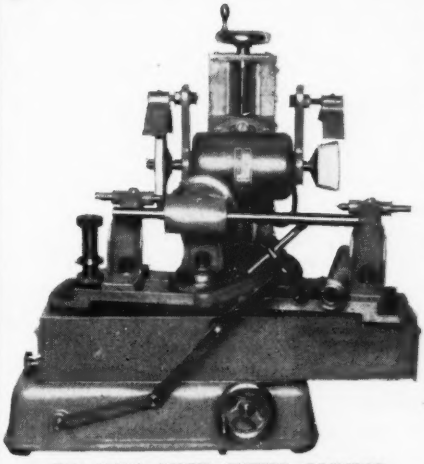
Finest Band Saw of its capacity ever built.

Write for Bulletin 192-M.

OLIVER MACHINERY COMPANY

Grand Rapids 2, Michigan

Grind it in a MINIT



THE NEW MINIT CUTTER GRINDER

• A new Cutter Grinder featuring hardened and ground table ways with table riding on ball bearings. Tilting wheel head. Hardened and ground bushing in work head. Hardened and ground cutter adapter. Swings 9¾". Takes 15" between centers. 9" table travel. Will grind all standard types of cutters.

For information write to

MINIT CUTTER GRINDER CO.

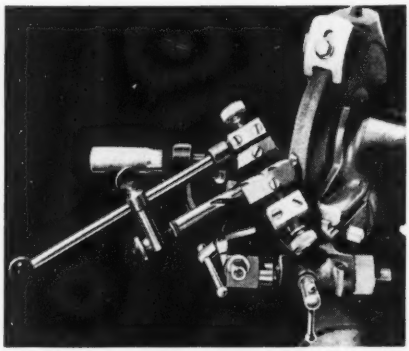
127 BLAKE ROAD

LEXINGTON 73 • MASS.

Attachment Permits Sharpening of Drills from 1/8 to 5/8 Inch

Delta Power Tool Division, Rockwell Mfg. Co., 603B E. Vienna Ave., Milwaukee 1, Wis., has announced a drill grinding attachment, designated as the No. 1296, for sharpening steel drills of any size from 1/8 to 5/8 inch using a standard tool grinder. Simple to operate, the attachment is said to produce correctly ground two, three, or four-lip drills.

As assembled at the factory, the attachment is arranged to produce the standard 118-degree lip angle with 12 to 15-degree heel or clearance angle. It is easy to adjust for other lip angles and other clearance angles if so desired. Micrometer adjustments are provided, and spline shafts are used to afford rigidity in any position. All parts can be adjusted for wear.



Delta No. 1296 Drill Grinding Attachment

MELCO CENTER POINT

LUBRICANTS...

ideal for wherever extreme pressure or frictional heat prevails . . . on lathe, milling or grinding centers, steady rests and journals . . . tapping, broaching and extruding. Also excellent additive for cutting, broaching, tapping or drawing oils.
Sold in tubes, quarts, gallons or drums in oil or grease form.

Send for Free Sample

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4470 Oakenwald Ave., Chicago 15, Ill.

Accurate Hole Transfer Made Easy With

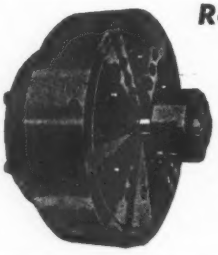
NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from 3/16" to 3/4" U.S.S. Inexpensive — Last for years.

Write for Circular
NIELSEN TOOL & DIE COMPANY
P. O. Box 1067
Berkley, Mich.

Automatic Hidden Arc Seam Welder Adaptable to Variety of Work

Cecil C. Peck Co., 22701 Lake Shore Blvd., Cleveland 17, Ohio, is now manufacturing a standard seam welder for automatically welding seams in metal ranging from 14 gauge to 1/4 inch. This universal horn type welding machine uses a "Lincolnweld" head and carriage for automatic hidden arc welding. It is designed for welding cylinders or other hollow shapes and can also be used to splice sheets and through-weld flanges in making containers. Work up to 18 feet long can be handled, and the machine can be extended to accommodate longer pieces. Minimum diameter is 12 inches.



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are always being developed. At first we are skeptical of them, but gradually we observe and consider their merits. Eventually we accept the benefits they have to offer.
So it was with SPEEDGRIP PRECISION INTERNAL CHUCKS. Today they are playing a leading role in leading industries of America. Send for your copy of the new SPEEDGRIP MANUAL today.

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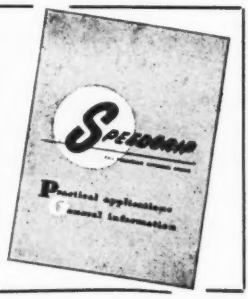
820 NORTH WARD STREET
ELKHART, INDIANA



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Complete engineering and manufacturing facilities for your broaching applications. Expert service for sharpening and reconditioning your broaches. Standard keyway broaches in stock.

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WHEN ACCURACY COUNTS...
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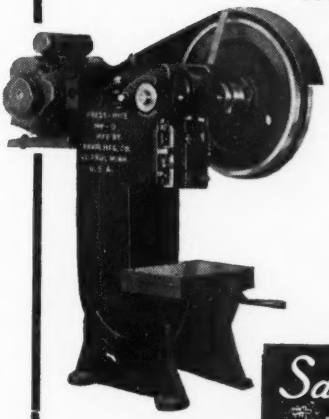
MAGNE-BLOX
SPEED SURFACE GRINDING SET-UPS!
• SAVE YOUR MAGNETIC CHUCKS
• ELIMINATE CLAMPS
• ELIMINATE HOLDING DEVICES

★ GRIND WORK SQUARE...
★ GRIND WORK PARALLEL...
★ HOLD ROUND PIECES...

•EVERY MAN CAN OWN HIS OWN•
WRITE FOR ILLUSTRATED FOLDER
GEORGE SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
198-A LAFAYETTE ST., N.Y. 12, N. Y.

CUT SET-UP TIME
WITH A
PRESS-RITE
5 TON
No. 0 OPEN BACK INCLINABLE POWER PRESS



Extra large die space on the No. 0 5 Ton Press-Rite Power Press, facilitates use of large and bulky dies . . . makes set-up work easier and faster. Reinforced high tensile alloy frames provide maximum rigidity . . . eliminate deflection . . . assure longer die life and reduced scrap. Write for free descriptive bulletin on the Press-Rite line of power presses today!

PRESS-RITE POWER PRESSES
available in 7 models—5 to 85 ton capacity.

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42

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SOLID STEEL COLLARS

Precision machined for shafts from 3/16" to 3" diameter inclusive.

Write for prices and name of your nearest distributor.

SPS

STANDARD PRESSED STEEL CO.

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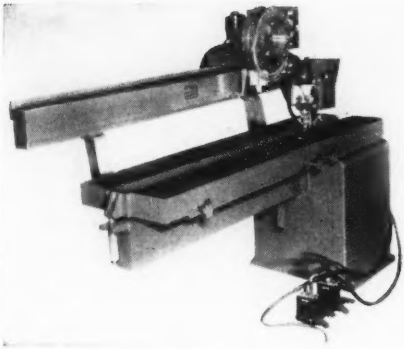
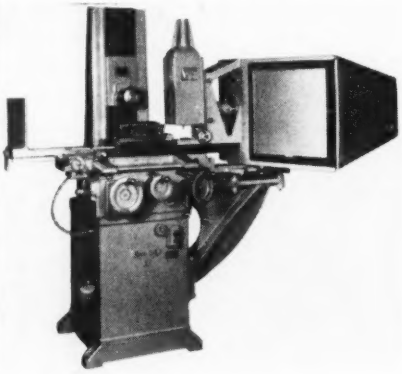


Peck Automatic Hidden Arc Seam Welder

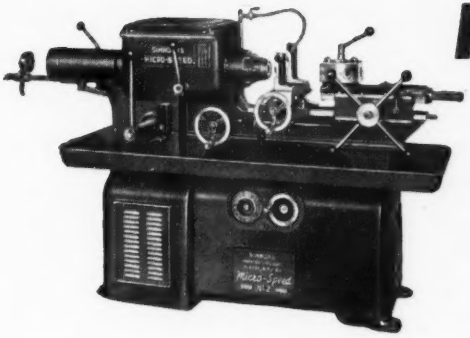
Work is placed over the rigid box section horn and the two edges of the seam to be welded are gripped by pneumatically operated heavy copper fingers. Clamping pressure of the fingers is provided by air tubes in a hollow box section weldment on top of the horn. An air operated copper anvil clamps tightly up against the back of the seam being welded. The machine can be used for automatic brazing or inert-gas-shielded arc welding on stainless steel and non-ferrous metals.

Contour Grinder Includes Improvements for Increasing Rigidity

The Cleveland Grinding Machine Co., 6514 St. Clair Ave., Cleveland 3, Ohio, has announced improvements in its "Visual-



Cleveland "Visual-Grind" Contour Grinding Machine



HERE IT IS!

The new Simmons No. 2 Turret Lathe, offered to you with three distinct advantages:

- **Low Cost**
- **High Precision**
- **Early Delivery**

Plain or Back-Geared — Forged steel spindle with anti-friction precision bearings, friction clutch and brake. Spindle nose, 2⅜"-8.

1¼" bar capacity—14" swing over ways. Micro-Speed Drive offers infinite speeds — plain, 375 to 1500 RPM; back-geared, 44 to 750 RPM — for bar or chucking work. Power feed to turret.

Write today for complete details.

SIMMONS MACHINE TOOL CORPORATION

1745 North Broadway, Albany 1, N. Y. **N. Y. Office: 50 East 42nd St.**

Beverly THROATLESS SHEAR

Cut any Shape... **STRAIGHT OR IRREGULAR**

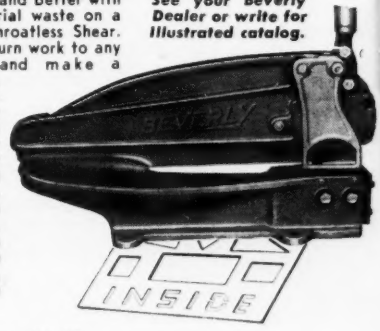
B-3 with Ball Bearing Hold Down

Make any cut — curved, straight or irregular, faster, easier and better with less material waste on a Beverly Throatless Shear. You can turn work to any position and make a clean cut as you go. Handles heavy gauges with ease — lighter metals without distortion. 4 models—capacitites 18 gauge to 3/16" mild. All shears equipped with High Carbon, High Chrome Blades.

INSIDE SLOTTER

8" Reach—16 ga. cap. Makes inside slotting cutting faster, easier, cleaner. Punch and die arrangement of 5 blades assures accuracy, clean cutting action. Cuts 2½"x1/16" slot at one stroke. Throat design permits pivoting work at any point in stroke for special inside cuts. Note sample cuts at left.

See your Beverly Dealer or write for Illustrated catalog.



BEVERLY SHEAR MFG. CO., 3000 W. 111th St., Chicago 43, Ill.

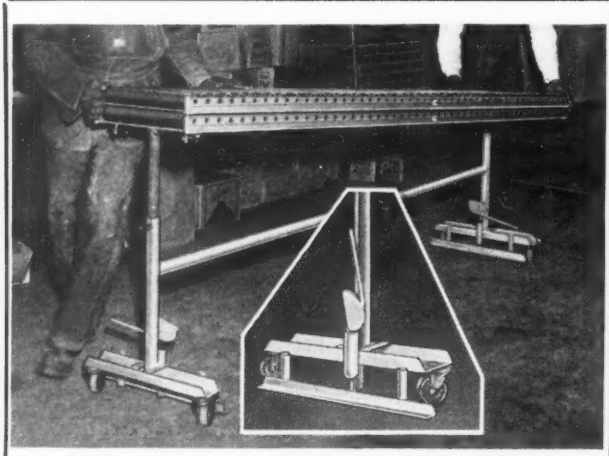
Grind" Contour Grinding Machine to increase rigidity in construction and to obtain maximum precision. The support for the entire optical projection section is now a heavy casting of aluminum alloy. Improvements within the optical section itself include fins in the lamp housing to increase radiation and dispersion of heat to prolong lamp life; adjustment of lamp housing by handwheel, worm gear, and screw; and preset lens tube to ensure focus.

The longitudinal and cross traverse movement of the optical section is now effected on hardened steel ways and rollers, making adjustment easier and completely counterbalancing the entire optical system. Variable powered longitudinal feed of the table relieves the operator of hand feeding during the rough and finish grind phases. Bijur one-shot lubrication is also now a standard feature.

Utility Magnifier Provides High Power

Especially recommended for machinists, researchers, laboratory technicians, chemists, and other individuals performing operations requiring clear close-up examinations, a utility magnifier which is said to provide unusually high power together with a wide and flat field of view is now being marketed by Edmund Scientific Corp., Dept. 44, Barrington, N. J. Designed for desk or table use, the magnifier is ruggedly constructed, having an aluminum body equipped with a special ring to "lock" the glass in focus. Magnification is accomplished by means of fine, precision achromatic lenses with Neoprene gaskets to seal the lens system against moisture and dust. The eye lens has a clear diameter of $1\frac{7}{8}$ inches and the objective lens a clear diameter $1\frac{3}{8}$ in. The magnifier is offered in 5-power and $6\frac{1}{2}$-power models.

Edmund Utility Magnifier



PORTABLE WHEEL and ROLLER GRAVITY CONVEYORS

Save Money on Your Handling Jobs

Standard 5' and 10' sections and 45° and 90° curves on portable tripod stands or portable section stands (as illustrated) with or without "Pelican" Floor Lock (See insert).
Ideal for warehousing, loading and production line use. Easy to handle and move.

POWER UNITS

Belt type Horizontal and Floor-to-Floor "Power Helpers" Live Roller CONVEYORS

ASK FOR FOLDER 1251

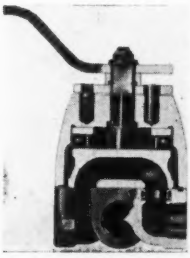
METZGAR

METZGAR CO.

466 Douglas St., N. W.
GRAND RAPIDS 4, MICH.

Valve Designed for Extreme Pressure Control

A valve featuring a "Shear-Seal" principle which is said to provide for extreme pressure control is now being manufactured by Barksdale Valves, 1566 E. Slauson Ave., Los Angeles, Calif. A pressure balanced self-aligning tubular valve seat is arranged to maintain accurate contact with the mating surface of an optically flat porting disc. The rotary movement of this disc opens and closes the flow passages. During the absence of fluid pressure, a heavy marcel spring-washer maintains the contact between sealing surfaces while a predetermined hydraulic force acts on the seal under extreme pressure.



Cutaway view of Barksdale "Shear-Seal" Valve

The valve is available in a wide range of types and pressures, including shutoff valves from ¼ to 1½ inches for pressures from 0 to 6,000 p.s.i.; four-way selector valves from ¼ to 1½ inches for pressures from 0 to 6,000 p.s.i.; four-way dual pressure valves in two classes (1) for 3,000 p.s.i. maximum pressure and (2) for 6,000 p.s.i. maximum pressure; and manipulator valves from ⅜ to 1 inch for pressures from 0 to 1,500 p.s.i. The service ratings include all common industrial media such as water, air, hydraulic oil, gas, fuel, and petroleum.

Valve rotors are hardened corrosion-resistant steel castings with smooth rounded flow passages to minimize resistance and turbulance. Bodies are high tensile hydraulic bronze and available with regular in-line, straight, or manifold porting. Housings are corrosion-resistant Meehanite and designed for flexibility in mounting.

5 ways to use LOVEJOY

VARIABLE SPEED PULLEYS

FOR QUICK PRODUCTION CHANGES

- Speedability of different operators
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- Variation in temperature or humidity
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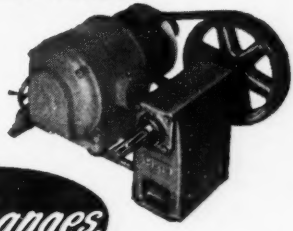
- Changes in production schedules



No Stops for Speed Changes.

Easily installed with any equipment, new or old. Finger-tip control. Available from fractional to 8 H.P. duties.

SHIPPED FROM STOCK

Write for complete catalog today.

LOVEJOY FLEXIBLE COUPLING CO.

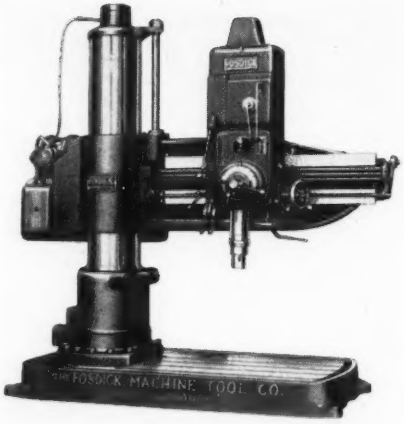
Also mfrs. of Lovejoy Universal Joints & Variable Speed Transmissions

5007 W. LAKE ST. CHICAGO 44, ILLINOIS

Radial Drill Features Super-Finished Column

According to an announcement made by The Fosdick Machine Tool Co., Cincinnati 23, Ohio, the column on each of its hydraulic radial drills is now superfinished, thus eliminating unsightly grinding wheel feed lines on the column. This mirror finish with the proper lubrication is claimed to prevent wear and scoring of the column for a period of many years.

The arm and column lubricating oil reservoir is replenished each time that the arm is elevated. The source of oil is taken from the pressure side of the hydraulic elevating motor. All excess oil is returned to the reservoir and strained and filtered before reusing. The arm is provided with a Neoprene wiper and a felt oil distributor to clean and lubricate the column, thereby preventing scoring of the column.



Fosdick Hydraulic Radial Drill with Super-Finished Column

CAMS

A **complete** cam cutting service for both large and small cams is offered by our **ROWBOTTOM** and **DALY** cam milling facilities.

May we quote **YOU?**

BLAIR TOOL AND MACHINE CORP.
119-03 15th Ave. College Point, L. I., N. Y.

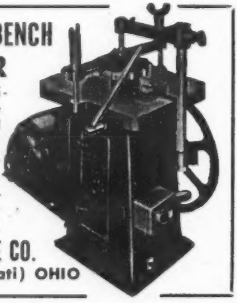
READING BENCH KEYSEATER

Portable — move directly to job; a time saver for both small and large shops.

3¾" stroke; adaptable for other work.

Low first cost — prompt delivery.

Good dealers wanted.



READING MACHINE CO.
READING (Cincinnati) OHIO

Unit Provides for Flat Edge Trimming of Drawn Shells

Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn., has announced the Dayton Rogers Model 2-A Shell Trimmer illustrated herewith for the flat edge trimming of square, rectangular, and irregular shaped drawn shells with small

Monarch Precision SHAPLANE Radius Tools

Illustration shows convex cutter for ¼" to 2½" balls.

FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS

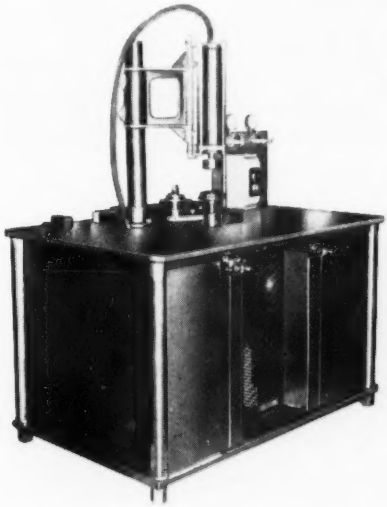
Range ½" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.

PATENT PENDING

Write for circular

C. B. TEETER, TOOL ROOM SPECIALTIES
4470 Oakenwald Ave., Chicago 15, Ill.

corner radii. Not only designed to flat edge trim all drawn shells, the machine is also said to have a capacity for forming, offsetting, beveling, beading, serrating, stenciling, and other operations. According to the manufacturer, the machine will perform such operations on drawn shells of practically any depth and of any sheet alloy stock up to and including a thickness of 13 gauge. The machine is provided with a standard 3 h.p. 1,750 r.p.m. motor and requires shop air pressures



Dayton Rogers Model 2-A Shell Former

varying from 20 to 80 p.s.i. The complete shell former weighs approximately 3,000 pounds.

Semi-Noiseless Electric Vibrators of Larger Sizes Announced

Syntron Co., 309 Lexington Ave., Homer City, Pa., has announced the addition to its line of bin, hopper, and chute vibrators of semi-noiseless models of larger sizes. These vibrators, it is claimed, perform the same function as the standard models with a sharp reduction in operating noise due to a design change in which metallic striking parts have been eliminated and rubber bumpers substituted.

The new vibrators are available in four models with capacities for use on small

NUMBERALL

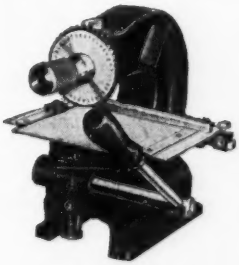
CUTS THE COST OF STAMPING NUMBERS

New Model 40B

NUMBERING and LETTERING PRESS

Mono Wheel — Automatic Spacer

Designed for impressing Letters and Numbers in all kinds of flat metal parts. Stamps plates up to 5" w. x 6" l. Carriage table advances one space with each impression of the dial, like a typewriter, doing rapid work, even spacing and perfect alignment. Different size dials are interchangeable. Direct sight gauge facilitates stamping in the proper space.



New Model 40B

Write for Bulletin MS40B

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

NOW there are THREE in the WALTON FAMILY

The Walton Company has added *Walton-American Tool Holders* to its line of time- and labor-saving tools — the well known *Walton Tap Extractor* and its companion *Reps Pipe and Stud Extractor.*

WALTON TAP EXTRACTORS

Universally used for removing stubborn, balky taps that break off deep in threaded work. Quick, easy, inexpensive. Will not damage threads.

WALTON-AMERICAN TOOL HOLDERS

Many holders in one. Head will swivel around an entire circle. May be set for straight, right or left-hand offset positions. Will hold with perfect grip any size square or round tool bit or boring bar.

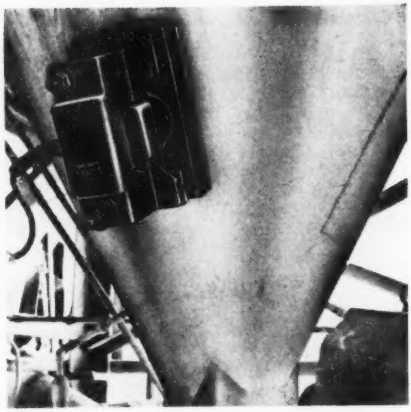
REPS PIPE AND STUD EXTRACTORS

When faced with broken pipes or studs that defy movement—here's the tool. Makes a strong, four-point grip without need for hammering or pounding. Hardened steel—will remove any material.

SEND FOR NEW CATALOG OF WALTON TOOLS

THE WALTON COMPANY
Dept. 10, Hartford 10, Conn.
Please send your new catalog of Walton Tools with full details of free trial offer.

Name .....
Street .....
City ..... State .....

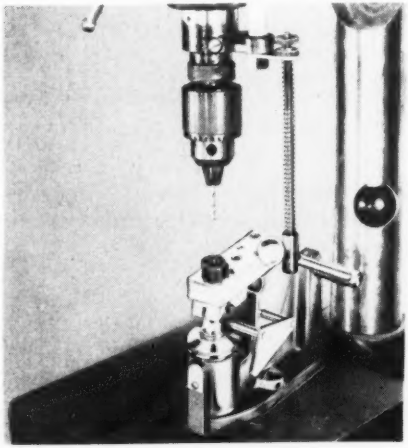


Syntron Semi-Noiseless Electric Vibrator applied to large hopper

hoppers containing as little as 20 cubic feet of material up to bumpers for hundreds of tons of material. Each unit is furnished with a variable vibration controller by means of which the intensity of vibration can be regulated.

Improved Drill Jig Provides for Easier and Faster Adaptability

Manufacturer's Engineering Service, Security Bldg., Toledo, Ohio, has announced the introduction of a highly im-



"Kam-Grip" Improved Model X750 Drill Jig

proved and simplified model of its X750 "Kam-Grip" Drill Jig. Two unique changes in the jig are said to result in easier and faster adjustability, as well as greater accuracy where close tolerance drilling is required.

Only one bushing is now required to accommodate a range of standard drill bushings up to $\frac{1}{2}$-inch drill size, replacing the former two bushing plates furnished with the original jig. Moreover, only one double-end anvil is now required to accommodate work stock diameters from $\frac{1}{8}$ to $\frac{3}{4}$ inch in place of the two double-end anvils formerly necessary. Set-up time is accordingly reduced in adapting the jig for use from one job to another, and the possibility of misplacing or losing accessory parts when the jig is not in use is said to be eliminated. The Model X750 can be operated manually, or automatically when actuated by the drill press spindle. A lock-release rod for such automatic operation is furnished.

Lathe Faceplate Includes Adjustable Slide to Minimize Set-Up Time

A faceplate for small lathes announced by Micro Lathe Plate, Inc., 1265 W. 2nd St., Cleveland 13, Ohio, includes an adjustable slide with boss which is designed to minimize set-up time and enable an ordinary lathe having an $1\frac{1}{2}$-inch 8-pitch thread spindle to accurately machine regular and odd shapes and perform offset work. Work can be attached

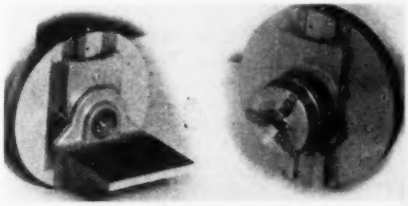


Illustration showing Micro Lathe Faceplate fitted with ell plate (left) and three-jaw chuck (right)

to an ell plate or any special fixture in an approximate position while at the bench and then quickly centered by adjusting the faceplate slide after the ell plate is attached to the boss. By moving the slide and rotating the ell plate on the boss, any point of work can be brought

MULTIPLE DRILLING with a...

MULTI-DRILL

Increases Capacity Up to 800%
ADJUSTABLE TO ANY HOLE PATTERN
. . . FITS ANY DRILL PRESS

If your production requires drilling from 2 to 8 holes in a work piece, a MULTI-DRILL will cut costs and speed output up to 800%. The MULTI-DRILL is universally adjustable to any hole pattern—is compactly built to permit easy, unhampered operation with drill jigs or other special fixtures. Ruggedly built to take the wear and tear of high production work, the MULTI-DRILL will handle your long and short run multiple drilling jobs with ease and economy. The MULTI-DRILL will drill on hole centers as close as $\frac{1}{2}$"—handle drill sizes up to $\frac{3}{8}$" in steel. Special adaptations available.

There is a Commander MULTI-DRILL Distributor in your area. Write for his name, literature and complete details.

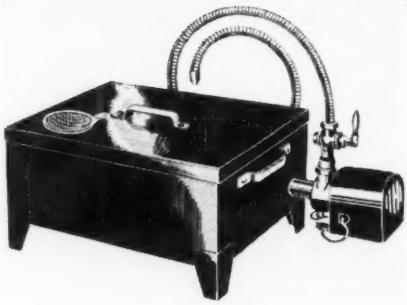
COMMANDER MFG. CO.
4224 WEST KINZIE ST. CHICAGO 24, ILL.

Product of *Commander* — Builder of Production Tools

quickly to the exact spindle center. To perform offset turning, drilling, or boring operations, a three-jaw chuck can be attached to the adjustable slide of the faceplate.

Coolant System Applicable to Variety of Small and Medium Machine Tools

Said to be ideal for use with small and medium machine tools such as drill presses, lathes, grinders, saws, cutoff machines, and belt sanders, a coolant system developed by Samuel S. Gelber Co., 162 N. Clinton St., Chicago 6, Ill., has a capacity of 450 gallons per hour (water fluid) at 2 feet, 276 gallons at 6 feet, and shutoff at 12 feet. It is also claimed to handle fluids of extreme viscosities at reduced volume.



Gelber Portable Coolant System

The pump is of all rubber (Hycar) and is claimed to be unaffected by oils, kerosene, coolants, or abrasives. A $\frac{5}{8}$-inch suction and discharge opening permit fast and easy attachment of the pump, which includes a double-bladed rubber molded impeller on a stainless steel shaft. The pump also includes a friction resistant rubber seal that is said to contribute to long life of the pump.

The motor is a 1/35 h.p. shaded-pole single-phase 3,000 r.p.m. 115-volt fan-cooled continuous duty unit which is furnished complete with a 6-foot cord with plug. The tank is a 4-gallon welded steel unit with sludge baffle, strainer, cover, and carrying handles. Standard equipment of the complete unit includes a flow control valve, 6-foot flexible metal tubing, and nozzle.

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Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

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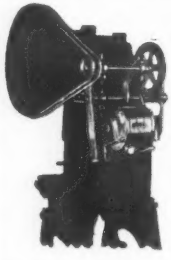

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Utilize standard 1750 RPM motors.
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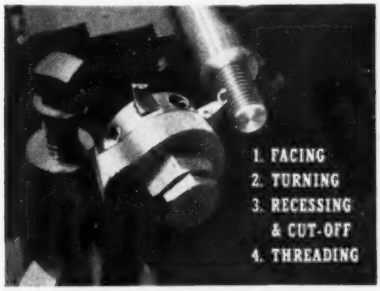
MODERN MOTOR DRIVES DIV. of The Nichols Engr. Co.
Dept. MS, 3816 W. GRAND AVE. CHICAGO 51, ILL.

Vertical Turret Toolholder Saves Time on Engine Lathe Work

A vertical toolholder which is designed to save time on engine lathe work is now being produced by Wilgus Mfg. Co., 1722 E. 16th St., Los Angeles 21, Calif. The quick-indexing head accommodates four differently ground tool bits which may be brought into working position by indexing the turret. An internal locking pin located at the end of the shank and beneath the base of each tool bit serves to position each tool in its proper place. Tightening a lock nut secures the turret solidly in working position.



Wilgus Vertical Turret Toolholder in use

The Wilgus Vertical Turret Toolholder can be used on work between centers since it does not interfere with the tailstock. The turret head is made of heat-treated alloy steel and is ground to provide a close fit with the heat-treated tool shank. The indexing head is designed to accommodate $\frac{5}{16}$ x $\frac{5}{16}$ x 1¼-inch tool bits. The shank measures ½ x 1⅛ x 6 inches overall and is available in a right-hand, left-hand, or straight style. The toolholder, which weighs 1½ lb., allows for the performance of facing, turning, recessing and cutoff, and threading operations without changing tool bits.

Optical Device Provides for Economical Structural Analysis of Metal Samples

The Griswold OPL Metallograph introduced by F. T. Griswold Mfg. Co., Wayne, Pa., is said to afford a rapid, economical method of determining the structural analysis of metal samples and other substances. Complete facilities for examina-

Leaders over 50 years
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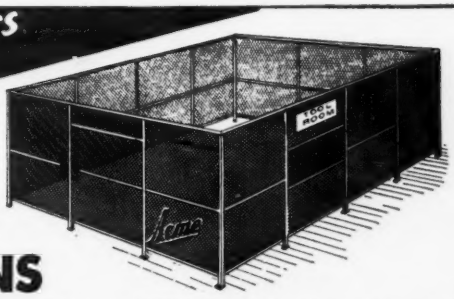
TOOL CRIBS and PARTITIONS



Standard Sections Woven Wire Mesh Panels and Doors to enclose Tool Cribs, Stock rooms and other enclosures.

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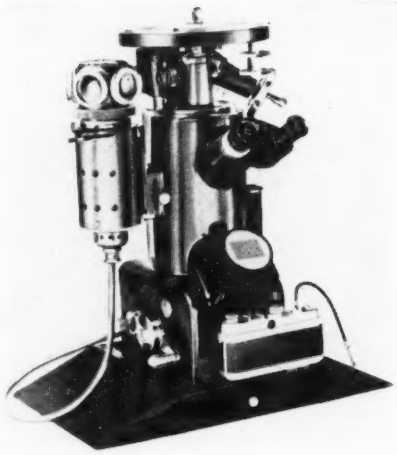
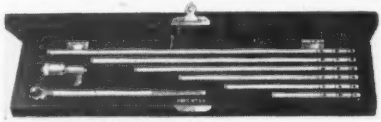
tion, study, and photographic reproduction are provided for uses that are encountered from research to routine testing. A large assortment of objective, ocular, and projective lenses is furnished.

The OPL Metallograph is extremely compact, occupying a table space of less than 12 x 12 inches. The overall height of the unit is 18 inches. Controls are provided for fast, positive manipulation of all variables. The staging table may be lifted instantaneously for lens changes, and lenses can be quickly inserted and removed, with no centering. In addition, no refocusing is necessary when lenses are changed. The technician can observe the sample through binoculars or on a ground glass screen without changing his position. Photographs may be taken on 35 mm. roll film by merely swinging the image from the ground glass to the camera.



Griswold OPL Metallograph



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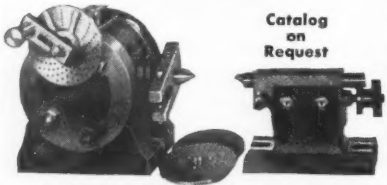

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3525 Cardiff Ave., Cincinnati 9, Ohio

Lightweight Pneumatic Screw Driver and Nut Runner Weighs 8 Ounces

Described as shorter than a fountain pen and less than an inch in diameter, a high speed miniature pneumatic screw driver and nut runner weighing 8 oz. is now being marketed by Newage International, Inc., 235 E. 42nd St., New York

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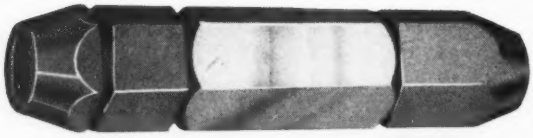

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HURON MACHINE PRODUCTS DEARBORN • MICHIGAN 14831 W. WARREN, BOX 146

17, N. Y. Designated as the Desoutter M60, the tool is said to be particularly suitable for assembly line work in instrument making; radio, radar and television assembly; telephone, camera, and clock

Desoutter M60 Miniature Screw Driver and Nut Runner

making; and the manufacture of small home electrical appliances, typewriters, business machines, and a variety of other products and equipment.

Designed for use with all screws from No. 1 to No. 8 ANF and ANC and equivalent nuts, the tool includes a high speed rotary-type motor which operates at 14,000 r.p.m. and is coupled directly through an impact-type clutch to the screw driver bit. To use, the operator simply applies the tool to the screw head. Air is automatically switched on when the bit comes in contact with the screw head and is switched off when pressure is released. A pressure reducing valve is set for the required tension, thus assuring that all screws and nuts are driven to uniform tightness. A reversing control built into the head of the tool makes it suitable for disassembly work. The impact-type clutch, it is claimed, can readily loosen any screw which it has been used to tightened.

Maximum Safety in Changing Type Provided by Press Holder

A press type holder which is said to allow a press operator to remove and replace the type chase without placing his hands in a dangerous position has been introduced by M. E. Cunningham Co., 158 E. Carson St., Pittsburgh 3, Pa. Designated as the Model PH-50, the holder includes a removable type chase and a shank with a yoke-shaped outer frame. The shank, which remains in the press while type is being changed, can be made to any size to meet individual press requirements. Attached to the shank is a replaceable ground tool steel base plate.

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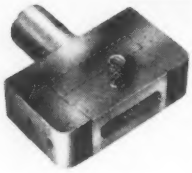

Cunningham Model PH-50 Press Style Holder

The type chase is made with a T-head that fits in machined offsets inside the holder frame. To prevent injury from accidental activation of the press, a small knurled handle is fastened permanently in front of the chase. While removing the chase for the purpose of making type changes, the press operator simply holds this knurled handle by two fingers, thereby keeping his hands free of the press. The type chase is reset in position by tightening a set screw on one side with a special Allen wrench.

The slot in the type chase can be made for either straight line or curved line marking. Shouldered type is dropped into position through the back of the type chase. For curved line marking, tapered type is furnished.

Solenoid Valve Provides for Maximum Safety

Maximum safety for operators is said to be provided by an air control solenoid valve introduced by Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich. Known as the Ross

Ross Safety Valve

Safety Valve, the unit includes no springs and is so arranged that if the air or electrical supply is interrupted, the valve moves to a safe position.

Features include a Ful-flo orifice which provides maximum capacity; oversize exhaust to afford fast control; free and continous operation provided by floating the pilot operation lever on needle bearings; hinged solenoid protecting cover which permits easy accessibility

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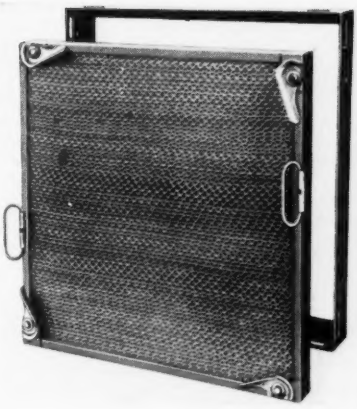
and provides protection against dust, water, and other external elements; opening in the cover to permit manual operation of the valve; and easy maintenance through removal of valve parts as assemblies. The valve is ordinarily arranged for operation with line pressures of 40 to 125 p.s.i. but can be designed to operate outside of these limits. Constructed for in-line or bracket mounting the valve is available in ¼ to 1¼-inch pipe sizes, straightway or three-way, normally closed or normally open models.

Air Filter Designed to Operate at Velocities up to 500 F. P. M.

Identified as the Type HV, a high velocity unit air filter which is designed to operate at velocities up to 500 f.p.m. and maintain a uniformly high cleaning efficiency over a wide range of air velocities has been introduced by American Air Filter Co., Inc., 100 Central Ave., Louisville 8, Ky. The filter is made of corrugated strips of fine mesh wire in which the corrugations taper so that when two strips are placed together they form a series of pyramid shaped pockets. The small ends of the pockets are closed to the air flow to eliminate any open air passages through the media.



American Type HV Air Filter

The filter can be serviced in the conventional manner with washing and charging tanks or reconditioned by washing out the accumlated dust with a hose and spraying with filter adhesive.

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COOLEY ELECTRIC MANUFACTURING CORP.
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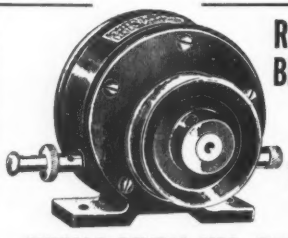
Flux Saves Silver Solder

AG Flux now being marketed by Farrelloy Co., 1235 N. 26th St., Philadelphia 21, Pa., is said to increase the bond of silver solder on stainless steel, Monel, nickel, copper, brass, bronze, and steel. The material is described as a low-temperature flux with a powerful scavenging action that acts on the silver solder to eliminate the time lag between fluidity of the solder and its adherence to the parent metal. The flux is claimed to increase the spreading action of silver solder and increase the tin coverage, thus saving precious silver.

By increasing the fluidity of silver solder, AG Flux, the manufacturer states, reduces porosity to the vanishing point and thereby produces clean, non-porous brazed joints. It is further said to reduce the mechanical skill required by the operator since it is designed to withstand a wide range of heat, with the result that the joint provides for a high degree of strength with no sacrifice in ductility.

On copper aluminum alloys, which have been found difficult to solder, the flux, it is claimed, actually disburses the aluminum oxide, leaving the silver solder uncontaminated with residual oxide. The flux residue may be removed by washing with hot water, and the flux may be thinned with water without reducing its effectiveness.

Illustration depicting use of AG Flux in silver soldering metal rings



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First low cost high precision Angle Dresser on the Market. Can be set very accurately with a Protractor. Works underneath the wheel. Large bearing surfaces.

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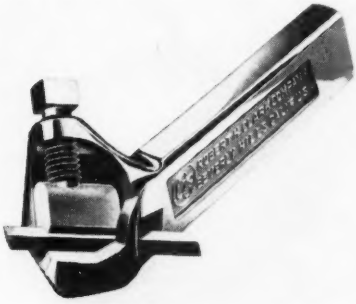
Please Send D.O. No. with Order, when possible.

Adjustable Toolholder Has Vise-Grip Jaw

Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif., has announced an adjustable toolholder with



Clark Adjustable Toolholder

vise-grip jaw that is designed to exert equal pressure over the full length of the cutter channel, thus eliminating any tendency on the part of the tool bit to rock and permitting faster feeds and deeper cuts, the manufacturer states. Moreover, the adjustability of the screw-operated vise-grip jaw allows for the handling of several sizes of tool bits—square, oversize, round, and out-of-round.

The toolholder is drop forged, heat treated and hardened for maximum resistance to mushrooming and wear. The vise-grip jaw, which is said to prevent channel wear immediately below the set screw, is designed to rigidly clamp short tool bits and stub ends as well as narrow tool bits for cutting-off or special forming operations. The tilted head affords the operator a clear view of the cutting edge. The holder is available with both standard 15-degree channels and parallel channels for carbide bits, threading tools, and boring bars.

Steady Rest Especially Suited for Mounting Extra Large Work

A steady rest for mounting extra large work in a lathe has been announced by South Bend Lathe Works, South Bend 22, Ind. Now available for South Bend 16 and 16-24-inch lathes, the steady rest is designed to accommodate work between 4¾ and 10¾ inches in diameter and is especially suited for machining pipe,

cSe

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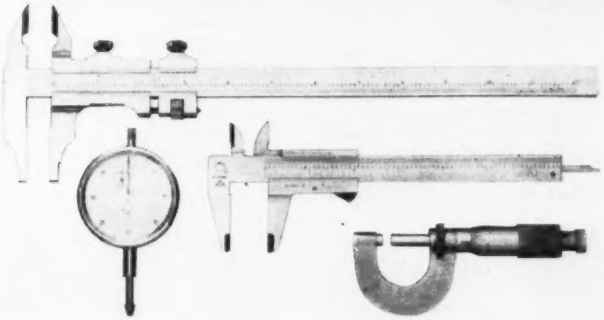

This line consists of: All types of Vernier Calipers, incl. Height Gages. All types of Micrometers. Dial Indicators. Universal Bevel Protractors. Squares, Surface Gages, Layout Plates, etc. The finest and most precise Gear Testing and Lapping Equipment. The line is of HIGHEST quality and workmanship, and obtainable at EXTREMELY favorable prices.

We also invite your inquiries on our imported Optical Circular Tables and first-class Machine Tools (Jig Borers, Lathes, Milling Machines, Combination Bandsaw and Filing Machines, Turret Lathes and others).

ERNEST GOTTSCHALK CO., INC.

MANUFACTURERS' AGENTS

401 BROADWAY **NEW YORK 13, N. Y.**

pressure cylinders, and similar large diameter work that is not excessively heavy.

The steady rest features a compound thread jaw actuating mechanism which provides quick and easy wrenchless adjustment and locking for the jaws. Each jaw is moved in or out by turning a large knurled knob and is locked in the required position by a thumbscrew. A double-acting compound screw provides approximately $\frac{3}{16}$ inch of jaw movement for each revolution of the adjusting knob. The steady rest top is hinged for easy mounting and removing of the work. The brass jaws move in precision steel sleeves pressed into the supporting frame. All parts, it is claimed, are held to close tolerances in manufacture so that replacement is simplified in the event of loss or damage.

South Bend Extra Large Steady Rest

Shell Milling Cutter Arbor Adaptable to Millers and Cutter Grinders

Nelco Tool Co., Manchester, Conn., has announced a shell milling cutter arbor, designated as the Type C, which is readily adaptable to milling machines and cutter grinders having National Standard spindle tapers. Available in ½ to 2-inch diameters, the arbor is said to require no special wrench since all sizes are equipped with standard socket head lock screws.

The arbor is manufactured from chrome-molybdenum steel, precision

D & M AUTOMATIC PRESS GUARD

No Springs • *No Cables* • *Fits Any Machine* • *Low Initial Cost* • *Low Maintenance* •

• This punch press guard meets the most exacting standards of safety engineers and safety laws. Permits operator to feed the press without hindrance.

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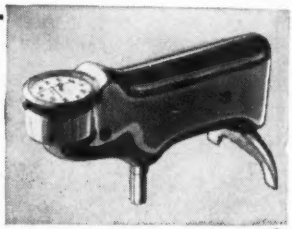
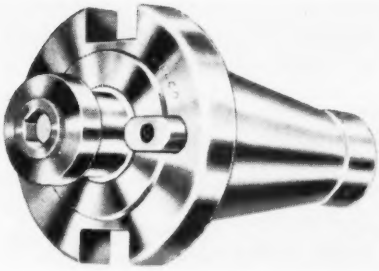
BARBER-COLMAN COMPANY, 1238 Rock St., Rockford, Ill.



Price $55.00 Net, F.O.B. Rockford, Ill. In fitted wood case with instructions



Nelco Type C Shell Milling Cutter Arbor

ground and heat treated for long accurate life. Removable keys allow for the instal lation of a side milling cutter if necessary.

Tool Applies and Removes Screws, Studs and Nuts

Mall Tool Co., 7814-C S. Chicago Ave., Chicago 19, Ill., is now producing a portable electric impact wrench for applying and removing screws, studs, and nuts. Said to be ideal for running nuts up to ½-inch bolt size, the tool, which is designated as the Model 2EW, can also be used to drill, tap, ream, and extract broken cap screws or studs, as well as for driving hole saws, wire brushes, and other tools.

Designed for easy one-hand operation, the 11-inch 7-lb. unit can be readily used in close quarters and includes a pistol grip and trigger switch that provide for easy control and instant response. The tool is powered by a reversible air-cooled motor designed for operation on 115-volt alternating or direct current. A model for 230-volt operation is also available

Mall Model 2EW Impact Wrench

Here's a smart little tap . . . he knows his business . . . he is a graduate of The Wood and Spencer University of Engineering. His Alma Mater, with a background of experienced mechanical instructors in spindle, alignment, breakage, chipping, speed, and lubrication can lead you to some surprising results. Give him a chance, "check his chart before you start." A Wood and Spencer tap can make the whole production line "Tap-Happy."

The Right Tap At The Right Time

The Wood & Spencer Company
Cleveland 3, Ohio

6" and 15 mm. scale

Hardened Jaws

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A model for practically every tool room and production operation.

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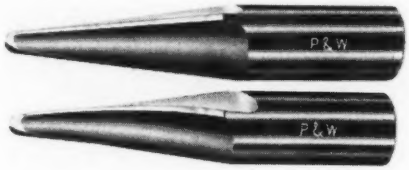
131 FLOWERDALE AVE. • DETROIT 20, MICH.

Taper Diesinking Cutter Has Finish-Ground Ball Nose

A taper diesinking cutter with full-cutting ball nose is now being produced in



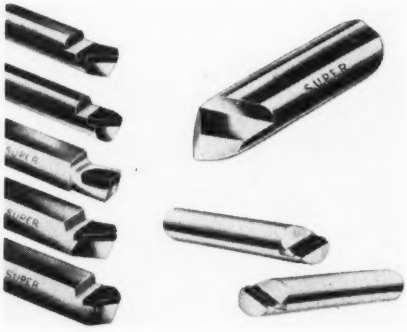
P & W Taper Diesinking Cutters

two types by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. The cutter is supplied ready to use with ball nose finish-ground to cut to dead center, so that no preliminary hand grinding is necessary. Two styles of fluting are available: straight, for easy hand sharpening; and spiral, for users who prefer helical cutting characteristics and have mechanical grinding equipment.

The cutter has a 7-degree taper (14-degree included angle) and is regularly furnished with right-hand cut and straight shank. The ball nose has a radius equal to one-half the diameter of the small end, and blends smoothly into the taper. All sizes in both types are regularly provided with Pratt & Whitney Diamond Blue hardening treatment.

Solid Carbide Boring Tool Added to Line

With the addition of a standard solid carbide boring tool to its line, Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.,

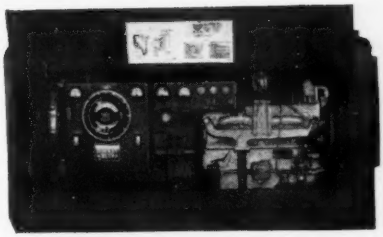


Super Standard Carbide Boring Tools

now offers a total of nine types of standard carbide boring tools. These tools are available in all the carbide grades listed in the company's new Catalog No. 50, and can be produced in other suitable grades on order. There is a standard type tool to fit each of the more popular boring machines, as per the illustration herewith.

Arc Welder Has Auxiliary Power Generator

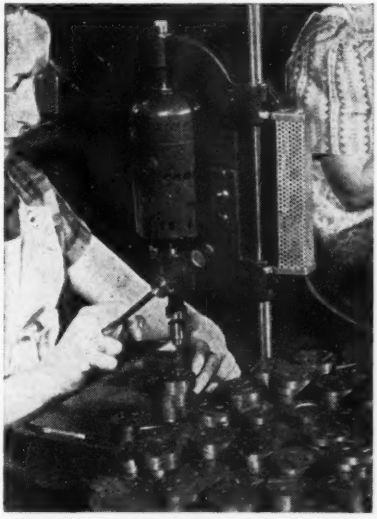
A special 300-ampere gasoline engine driven arc welder with a 3 kw. auxiliary power generator has been announced by Hobart Brothers Co., Hobart Square, Troy, Ohio. The arc welder and power generator is a self-contained unit powered by a six cylinder self-starting Chrysler industrial engine directly connected to the welding generator and mounted on a welded steel frame. The auxiliary generator provides for lights and such tools as lathes, grinders, drills, valve refacers, chipping hammers, power wrenches, and paint sprayers. The unit is completely enclosed by a sheet metal canopy that is bolted directly to the frame. Hinged side doors provide access to the control panels, engine, welding generator, and other parts within the canopy.



Hobart Special 300-Ampere Gasoline Engine Driven Arc Welder

Special Kit Intended to Extend Production Life of Carbide Tools

To help carbide tool users extend the production life of critical carbide-tipped cutting tools, the Industrial Products Division, Elgin National Watch Co., Elgin, Ill., has announced the availability of a special carbide conservation kit for lapping carbide tools. Contained in the kit are a 6-inch diameter Formica lapping



Three Electro-Mechano machines are used by pump manufacturer for drilling various holes in end plates, etc.

How to Drill Small Holes Fast and, With Precision

A prominent oil burner pump manufacturer has been using Electro-Mechano Drill presses for the past six years. His requirements are *both* precision and high production.

FOR HOLES FROM .004" TO .156" DIA. AT ANY ANGLE, IN ANY COMBINATION

These units can be placed at any angle and used in combinations for multiple hole drilling. Direct drive variable speed spindle provides speeds from 1000 to 10,000 or 2500 to 15,000 RPM.

AVAILABLE WITH AIR OR HAND FEED-VARIABLE SPINDLE SPEEDS

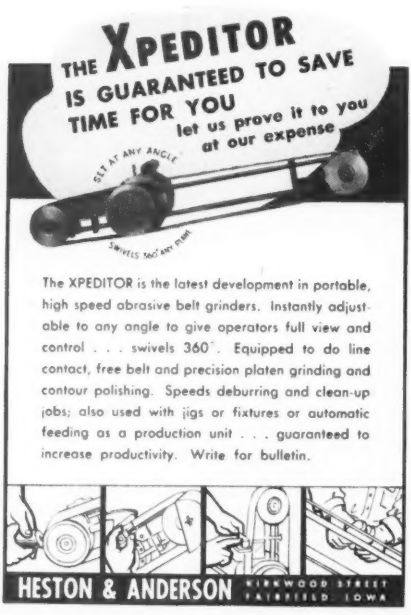
Shown at left is 8 inch hand feed model. Air feed model has hydraulic control.

WRITE FOR BULLETIN MM-650.

THE ELECTRO-MECHANO CO.
265 EAST ERIE STREET
MILWAUKEE 2, WISCONSIN

wheel, a "Dymo" applicator gun specifically modified to facilitate charging of the wheel, and 5 grams of Elgin "Dymo" Diamond Compound sufficient for lapping approximately 500 average single-point carbide-tipped tools.

Diamond lapping, a simple process requiring no more time in most cases than grinding, has been found to increase the life of carbide-tipped tools from 2 to 10 times, it is claimed. Lapped cutting edges are said to maintain their sharpness over long periods of use with minimum carbide removal. In addition, diamond lapped cutting tools are claimed to produce fine piece-part finishes.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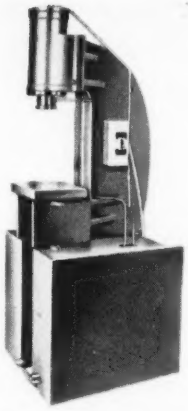
IS GUARANTEED TO SAVE
TIME FOR YOU
let us prove it to you
at our expense
SET AT ANY ANGLE
SWIVELS 360° ANY PLANE
The XPEDITOR is the latest development in portable, high speed abrasive belt grinders. Instantly adjustable to any angle to give operators full view and control . . . swivels 360°. Equipped to do line contact, free belt and precision platen grinding and contour polishing. Speeds deburring and clean-up jobs; also used with jigs or fixtures or automatic feeding as a production unit . . . guaranteed to increase productivity. Write for bulletin.
HESTON & ANDERSON
KIRKWOOD STREET
FAIRFIELD IOWA

Hydraulic Press



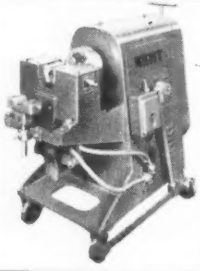
Ross 20-Ton Hydraulic Press

Ross & Co., 1401 E. 57th St., Chicago 37, Ill., is now producing a motor-driven 20-ton hydraulic press for assembling, broaching, crimping, drawing, forming, laminating, riveting, and general forcing operations. The press is double-acting and has an 8-inch throat and 12-inch ram travel. The clearance under the retracted ram is 16 inches, and the ram speed is 60 inches per minute down and 90 inches per minute up under full load. The ram is controlled by a foot pedal and is activated by a vane type pump arranged to operate at 1,250 pounds per square inch.

The entire press is of steel welded construction except for the cylinder, which is a Meehanite metal casting. The power unit is contained in the base, thus providing for a compact and portable unit occupying 28 x 34 inches of floor space.

Carbide Rotary Finishing Tools Specifically Designed for Tool and Diemakers

Severance Tool Industries, Inc., 724 Iowa Ave., Saginaw, Mich., has introduced a set of eight ¼-inch shank carbide rotary finishing tools specifically designed for the tool and diemaker. According to the manufacturer, the various



for chamfering bar stock

PRIOR TO SCREW MACHINE OPERATIONS

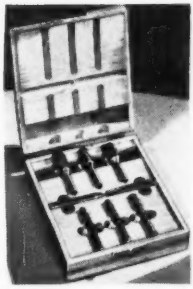
The KENT BAR POINTER

Entirely self-contained. Manual or pneumatic operated feed and gripping mechanism. Capacity ⅜" minimum diameter up to 2¼" hexagon. Stationary and portable.

Literature available.

The KENT MACHINE CO., Cuyahoga Falls, O.

Drillers . Threaders . Slotters . Countersinkers . Bar Pointers



Severance "Di-Car" Set No. 40

cuts, tooth patterns, and shapes were selected so as to provide the widest possible range of usefulness, working equally well on soft or hardened dies. The tools are furnished in a sturdy wooden case, the complete unit being designated as "Di-Car" Set No. 40.

Made of a specially selected grade of carbide resistant to flaking and chipping, the tools, it is claimed, feature both arrangements which provide maximum cutting efficiency to the entire cutter-head surface. It is also claimed that the tooth patterns are of a type which make possible rapid stock removal and minimize annoyance from slivers. The tools allow for easy finishing of intricate dies and hard-to-reach areas and, being made of solid carbide, may be economically reground a number of times.

Cutter Features Truncated Blades

Identified as the Series "70" Tri-Bit Face Mill, a heavy duty milling cutter featuring truncated triangular blades has been introduced by Weddell Tools, 37 Continental St., Rochester 11, N. Y. Very close blade spacing is said to be afforded without the loss of either body or blade strength. Also incorporated in the cutter is a unique wedge type lock for each blade which permits locking and unlocking the blade within a quarter to a half turn of an Allen wrench. The wedge bears against the front of the blade, forcing it into the vee. Each blade is backed up by a heavy fine pitched screw which allows for infinite adjustment throughout the life of the blade.

Weddell Series "70" Tri-Bit Face Mill

The cutter can be furnished with high speed steel, super high speed steel, cast alloy, and carbide-tipped blades. Boring tools, hollow mills, and special tools are also available using the same type blades.

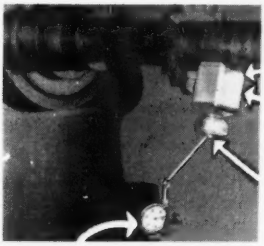
"MULTI-MITE" No. 100

The New, Amazing Magnetic Base Holder
for mounting Test Indicators to flat or curved surfaces
INSTANTLY!

Price $7.50
Handsomely wooden boxed.

Posts and adaptors included for taking most small indicators.

ELIMINATES CUMBERSOME HAPHAZARD CLAMPING



Easily mounts to shaft. Magnetic pull app. 50 lbs.

Base size, 1" x 1⅛".

Ball and socket swivel construction permits precision adjustment.

Shows mounting of MITI-MITE on mill arbor to line up milling vise.

OTHER "MITI-MITE" UNITS

No. 120—Combination Test Indicator Magnetic Base Holder and 4X double lens Magnifier.... **$12.00**

No. 150—Duplex Magnetic Base Holder for all dial indicators up to 3" dia..... **$15.50**

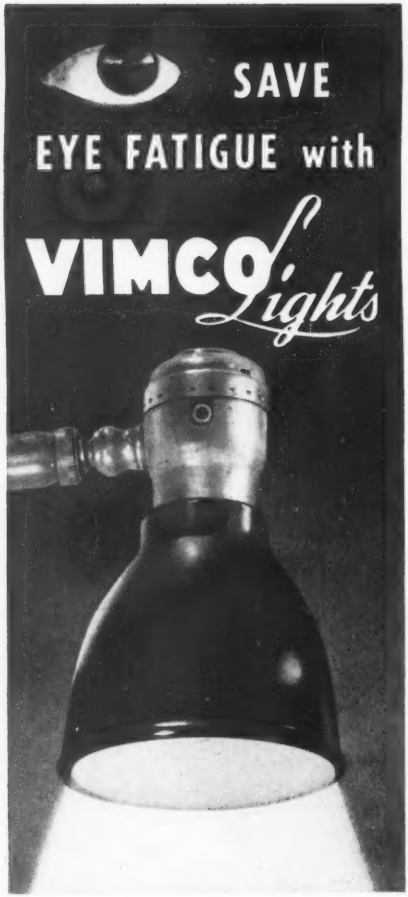
No. 200—Magnetic Base Handi-Lite, complete with 25 and 40 watt bulbs..... **$8.50**

No. 300—Combination of No. 100 and 200.

Send for Bulletins 602 and 603

ENCO MANUFACTURING COMPANY, Dept. 161
4524 W. Fullerton Ave., CHICAGO 39, ILL.

Order from your mill supply dealer or send order with name of your mill supply dealer



And when you prevent eye fatigue . . . you keep production up . . . you eliminate costly machine errors . . . and you help prevent personnel accidents. Remember, too, your customers expect your machines to be fully designed in every detail . . . that means they want the "on the point" lighting Vimcolights can provide. Vimcolights are easy to install, long lasting and backed by 30 years of specialized lighting.

Send for bulletin 74

VIMCO MFG. CO., Inc.

111 Brayton St. **Buffalo, N. Y.**

New Shop Literature

Bending Brakes. Dreis & Krump Mfg. Co., 7418 S. Loomis Blvd., Chicago 36, Ill., has issued a 12-page catalog (No. P-51) illustrating and describing its complete Chicago line of steel power bending brakes and power universal box and pan brakes. In addition to full specifications on all standard sizes of machines, the catalog presents details on features, including the improved motor drive, the clamping methods employed, and the easy and accurate controls that simplify bending operations. Also contained in the catalog are many illustrations showing the wide variety of bending operations performed with the various brakes.

Drill Presses. A four-page two-color bulletin (D.P. 51) available from Toolkraft Corp., Springfield 1, Mass., presents illustrations, descriptions, and specifications on a line of Darra-James Drill Presses, including single-spindle, multiple-spindle, standard, and production models.

Drill Jig Bushings. Printed on heavy, durable stock to withstand frequent reference usage, a four-page catalog listing types and sizes of drill jig bushings and containing handy technical information, data on drill sizes with their decimal equivalents, and a complete price list is now available from American Drill Bushing Co., Inc., 5107 Pacific Blvd., Los Angeles 58, California.

Electrical Measuring Instruments. A 12-page catalog (No. E-15) issued by Gray Instrument Co., 64½ W. Johnson St., Philadelphia 44, Pa., illustrates and describes potentiometers, Wheatstone bridges, Kelvin bridges, Kohlrausch slides, resistance boxes, resistance standards, volt boxes, precision shunts, and other electrical measuring instruments, as well as various types of levels.

Rust Preventive. Haas-Miller Corp., 4th & Bristol Sts., Philadelphia 40, Pa., is now distributing a 12-page booklet on Immunol on Immunol Solvent which, it is claimed, can be used efficiently and economically in practically all metal-working operations, particularly in those involving cutting, grinding, shaping, threading, drilling, and reaming.

Flexible Shaft Equipment and Accessories. For design, production, and purchasing departments, The S. S. White Dental Mfg. Co., Industrial Division, Dept. 5, 10 E. 40th St., New York 16, N. Y., has available a 52-page catalog (No. T-51) which contains complete descriptions and prices on flexible shaft arms and accessories; points, wheels, disks, burrs, and drills for flexible shaft tools; inspection mirrors; engine belts; gypsum products; industrial cements; bench lathe; blowpipe; standard flexible shaft combinations for power drives and remote controls; flexible shaft combinations for power drives and remote controls; flexible shaft adapters; pressure bulkhead fittings; actuators; and plastic shipping plugs and caps.

Collet Chucks. An eight-page bulletin (No. 8) presenting complete information on Hardinge-Sjogren Speed Collet Chucks for toolroom lathes, engine lathes, and grinders has been released by Hardinge Brothers, Inc., Elmira, N. Y. The bulletin contains engineering specifications with full illustrations of each type of chuck for threaded nose spindles, cam lock spindles, taper key drive spindles, and American Standard spindles.

Automatic Planetary Thread Rolling Machine. D. H. Prutton Machinery Co., 5295 W. 130th St., Cleveland 11, Ohio, has available a four-page folder illustrating and describing the "Rollmaster" Model 125 Planetary Thread Rolling Machine which is claimed to have a production speed of 25,000 pieces per hour.

Precision Punches. The Pivot Punch & Die Corp., 373 Old Niagara Falls Blvd., North Tonawanda, N. Y., has published a catalog (No. 514) covering a line of precision punches available in more than 276,000,000 standard sizes and styles in a choice of four qualities. First quality punches are high speed steel, straight-ground parallel to the axis of the punch for maximum strength and precision, with patented whipsleeve that absorbs vibration and increases punch life. Second quality punches are high speed steel, straight-ground parallel to the axis, without the whipsleeve. Third quality punches are high speed steel, cylindrically ground. Fourth quality punches are carbon steel alloy, cylindrically ground. The catalog thoroughly explains the services of the company in supplying punches and provides a complete price list, together with quantity discounts.

OLDEST and LARGEST MANUFACTURER
of
Cast Alloy Rotary Files

Equals carbide performance on most work . . . saves two-thirds the cost per file.

OVER
300 SIZES
AND SHAPES
ARE AVAILABLE.

WE REGRIND ALL KINDS OF ROTARY FILES.

FERRIOT ROTARY FILES
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SEND FOR CATALOG AND PRICE LIST

FERRIOT BROS., INC.
2685 MOGADORE ROAD • AKRON 5, OHIO

Punches and Dies

for MOST MAKES of PUNCH MACHINES

LARGE RANGE OF ROUND, FLAT, OVAL AND SQUARE SIZES CARRIED IN STOCK FOR IMMEDIATE SHIPMENT.

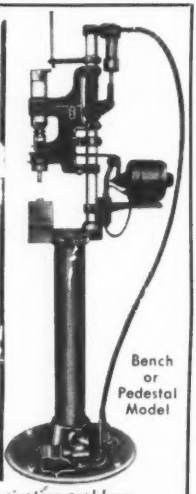
Send for catalog sheets.

T. H. LEWTHWAITE MACHINE CO.
317 EAST 47TH ST. NEW YORK 17, N. Y.

SAVE TIME - SAVE MONEY
Slash Production Costs
with **AIRFLEX**
Automatic Controlled Pneumatic Riveter
ROTATING IMPACT . . .
Strikes while hammer is spinning. Forms full tight head every time. No more spoiled pieces. Handle cold heads and unsupported rivets in brittle materials . . . such as glass, plastic, wood, hollow-ware.
Unexcelled for heavy duty and multiple riveting on metals and alloys.

- Precision, straight-line pneumatic hammer blow and fluted, electric motor rotated peen.
- Interchangeable pneumatic hammer units.
- Adjustable to any length, any type rivet.
- Makes solid loose joints, any length rivet.

Write us about your riveting problems.



Bench or Pedestal Model

Airflex PNEUMATIC Tools
LEMERT ENGINEERING CO.
IN THE HOOSIER STATE SINCE 38
Plymouth, Indiana

Jig Borer. A 12-page circular (No. 530) issued by Pratt & Whitney, Division Niles-Bemont-Pond Co., West Hartford 1, Conn., contains complete information on the features, specifications, standard equipment, and so on, of the Pratt & Whitney No. 4E Jig Borer for handling work loads up to 5000 lb. Data on additional equipment for use with the machine are included.

Rotary Surface Grinder. Mattison Machine Wks., Rockford, Ill., has released an eight-page two-color bulletin (No. 146-3RM) which contains full details and specifications, as well as illustrations, of the Mattison No. 36 Rotary Surface Grinder with capacity for any size of work or group of parts occupying space 30 inches in diameter.

Machine Knives. Simonds Saw & Steel Co., Fitchburg, Mass., has available a 16-page bulletin presenting complete information on a line of machine knives, including planer knives, woodworking knives, chipper knives, paper cutting knives, and miscellaneous knives.

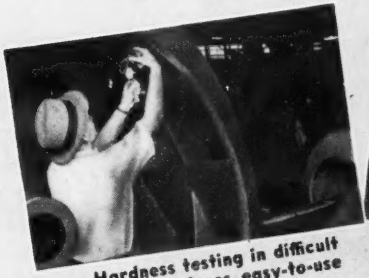
Hand Grinder. The "Hi-Power Grinder," a heavy duty production hand grinder for wide application in the industrial field, is described and illustrated in a four-page pocket-size folder published by Chicago Wheel & Mfg. Co., Dept. MMS, 1101 W. Monroe St., Chicago 7, Illinois.

Stationary Tachometer designed for permanent mounting on machines or panels and available in standard ranges from 10-100 to 1,000-10,000 r.p.m. is described and illustrated in Bulletin No. 794 issued by Herman H. Sticht Co., Inc., 27 Park Place, New York, New York.

Strip Metal Weight and Length Calculator. A handy weight and length calculator for all strip metals is now being offered by Precision Steel Warehouse, Inc., 4401-25 W. Kinzie St., Chicago 24, Ill. Intended for use by engineers, estimators, purchasing agents, pressroom foremen, slitter operators, and other individuals, the calculator is designed to enable the user to compute, at a glance, the weight and length of strip metals in coils or straight sections. Although the calculator is designed so that basic calculations are for cold rolled strip steel, a factor table is included which permits the user to find his answer for aluminum, brass, copper, magnesium, Monel, zinc, and many other metals.

HARDNESS TESTING MADE EASY WITH *Ames*

PORTABLE HARDNESS TESTERS



— Hardness testing in difficult places with Ames easy-to-use Portable Tester.

— Hardness testing large sheets. Reading directly in the Rockwell Scales.

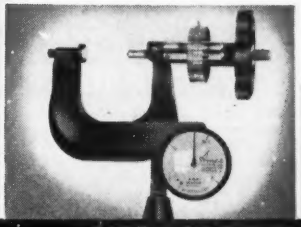
ARE TAKEN TO THE WORK
FOR QUICK, ACCURATE, SIMPLE TESTS

Hardness testing — before and after heat treating — is essential today.

Ames Portable Hardness Testers now make it practical and EASY to test for hardness at any stage of your manufacturing process. Make quick, accurate tests on the spot. No cutting off specimens. No waiting for laboratory tests. No skill is required. Anyone can operate.

Thousands are now in use and paying for themselves, over and over again. Investigate today how Ames Hardness Testers can be quickly put to profitable use in your plant.

Send for descriptive literature.



Ames Portable Hardness Testers are light in weight, compact, accurate and comparatively inexpensive. Models from 1" to 6" capacity.

AMES PRECISION MACHINE WORKS
WALTHAM 54, MASS.

Burnishing Machinery. A four-page illustrated bulletin available from Hauser Machine Tool Corp., 30 Park Ave., Manhasset, N. Y., presents details and specifications of machinery developed by Henri Hauser Ltd., Bienne, Switzerland to implement the new Hauser burnishing method.

Punch Press Safety Guards. A four-page three-color folder illustrating and describing a complete line of safety guards for punch presses has been published by All American Safety Equipment Co., 11 S. La Salle St., Chicago 3, Ill. The folder covers two different types of sweep guards and five different types of enclosure guards.

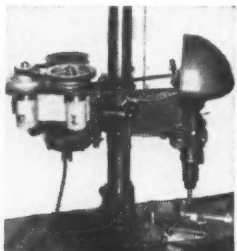
Cold Headed Fasteners. A 34-page 8½ x 11-inch wire-bound catalog (No. 60) illustrating and describing a wide variety of nails, rivets, screws, and other specialties available through the cold heading method has been issued by John Hassall, Inc., 394 Oakland St., Brooklyn 22, N. Y. The catalog contains many useful reference tables and is divided into labeled step-down sections for quick reference.

"Cutting and Grinding Facts." Factual data concerning more than 50 typical metal-working jobs are presented in an 80-page edition of the booklet "Cutting and Grinding Facts" issued by Sun Oil Co., Philadelphia 3, Pa. Much of the operational data is based on information supplied by leading builders of automatics, grinders, lathes, millers, and so on. The booklet also presents descriptions of Sun's straight and emulsifiable cutting oils. Of practical use to the shopman is a chart showing the correct Sun cutting fluids for many of the most frequently used metals and metal-working machines.

Race Grinder. A 16-page catalog (No. R-51) describing the Landis Tool No. 2 Race - A - Way Oscillating Cylindrical Grinder intended primarily for the precision grinding of ball bearing races but also applicable to other precision operations of a similar nature has been released by Landis Tool Co., Waynesboro, Pa. The catalog includes 13 large illustrations showing the machine and various operations which it can perform.

Dial Indicators. A descriptive folder listing a complete line of dial indicators and accessories has been announced by Chicago Dial Indicator Co., Dept. B, 180 N. Wacker Drive, Chicago 6, Ill. The folder introduces the new Geneva No. 145F Dial Indicator designed especially for the precision checking of variations in contour, dimension, or roundness within 0.0001 inch. Other dial indicators graduated to 0.0005 and 0.001 inch are also described.

V-Belts, V-Pulleys, and V-Drives. Maurey Mfg. Corp., 2908 S. Wabash Ave., Chicago 16, Ill., now has available a series of bulletins containing illustrated, descriptive, and tabular information, including list prices, on a complete line of V-belts, V-pulleys, and V-drives. Bulletin MV-201 covers multi-V-belts for heavy loads; Bulletin R.F. 301-5003 deals with fans, V-pulleys, and fan V-belts designed for refrigeration and air conditioning; Bulletin FHP-101 pertains to fractional horsepower V-belts; Bulletin OEM-2000 discusses pressed steel and cast iron V-pulleys for original equipment manufacturers; and General Catalog CL-100 A presents a complete line of fractional horsepower V-drives, including pressed steel V-pulleys, cast iron V-pulleys, cast iron variable pitch V-pulleys, fractional horsepower V-belts, ground steel bushings, steel shaft collars, and V-pulley accessories.



Write Dept. M for price and details

NEW! LOW COST! TIME SAVING!

SPEED REDUCER

FOR DRILL PRESSES

- **Allows drill head to move freely up and down.**
- **Speed changes take less than a minute.**
- **Fits almost any standard motor base up to ¾ HP.**
- **Reduces spindle speed from 1725 RPM to as low as 100 RPM.**

Easy to install, the Newman Speed Reducer is a multiple-speed attachment which is valuable wherever drilling, tapping, and reaming are done.

LOUIS NEWMAN MACHINERY COMPANY

8-10 STEARNS SQ. • SPRINGFIELD, MASS.

The

Bridgeport

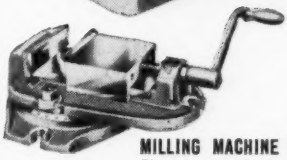
TURRET MILLING MACHINE

with its NEW 1 H.P. HEAD now provides capacity for handling a wider range of heavier work

With a record of versatility already established in tool rooms and production lines of countless shops (more than 13,000 machines in service in only 12 years) the new "BRIDGEPORT" 1 H.P. milling, drilling and boring head provides even greater machining possibilities . . . in increased capacity and ability to handle larger work.

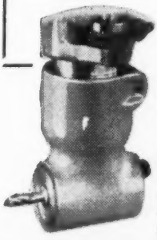
Among the features of this machine are: 8 spindle speeds from 80 to 2720 R.P.M. . . . back geared spindle drive unit utilizing full power at all speeds without belt slippage . . . a quill travel of 5" . . . power feed to quill in three steps . . . positive 2-way power feed stop tripping mechanism . . . spindle lock and brake . . . and a collet capacity up to ¾" diameter.

Investigate the possibilities of the "BRIDGEPORT" on your work . . . send for complete details on the machine and its attachments.



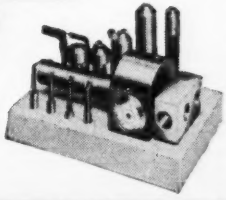
MILLING MACHINE VISE

This improved vise, attractively streamlined, assures greater gripping power provided by a large diameter screw. A coolant trough adds to its utility. Made in two sizes: 5" x 3½" and 6" x 5" jaw openings.



RIGHT ANGLE ATTACHMENTS

(Left) Heavy Duty attachment (made in two sizes) applicable to Master as well as 1 H.P. Bridgeport heads.
(Right) Light Duty type for milling and drilling narrow, deep molds and cavities.



No. 2 BORING HEAD

With this attachment, holes up to 6" diameter can be bored. It is applicable to the Bridgeport 1 H.P. Milling, Drilling and Boring Attachment.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Heating and Heat Treating Furnaces for defense production are illustrated and described in an eight-page three-color bulletin (No. SC-150) issued by Surface Combustion Corp., Toledo, Ohio. Profusely illustrated with views of numerous operating installations of this equipment, the bulletin covers heating for forging as well as heat treatments to develop the required properties for the production of all types of ordnance material, including ammunition, guns, tanks, aircraft, and ships.

"More Holes in a Hurry" is the title of a 36-page pocket-size booklet issued by Mall Tool Co., 7814 S. Chicago Ave., Chicago 19, Ill., which is designed to afford the reader a complete working knowledge of portable electric drills, their care, and how and where to use them. Special emphasis is placed on industrial and agricultural applications of portable electric drills, with several sections devoted to a step-by-step explanation of technical drilling operations, such as drilling pilot holes, drilling concentric in a scribed circle, and the proper drilling of various materials. A number of handy tables and charts provide instant reference to the various drill sizes and speeds required in performing jobs.

Custom Steel Parts. Henry Disston & Sons, Inc., 421 Tacony, Philadelphia 35, Pa., has published a 16-page bulletin explaining the unique setup of the company's custom steel parts plant and its varied facilities for furnishing custom-made flat steel parts to users' exact specifications. The booklet outlines the products of the plant, which include circular work, rectangular work, odd shapes, and intricate designs, and then describes in detail a number of unusual problems which were solved by the plant. Practical information is also presented on how to order custom steel parts.

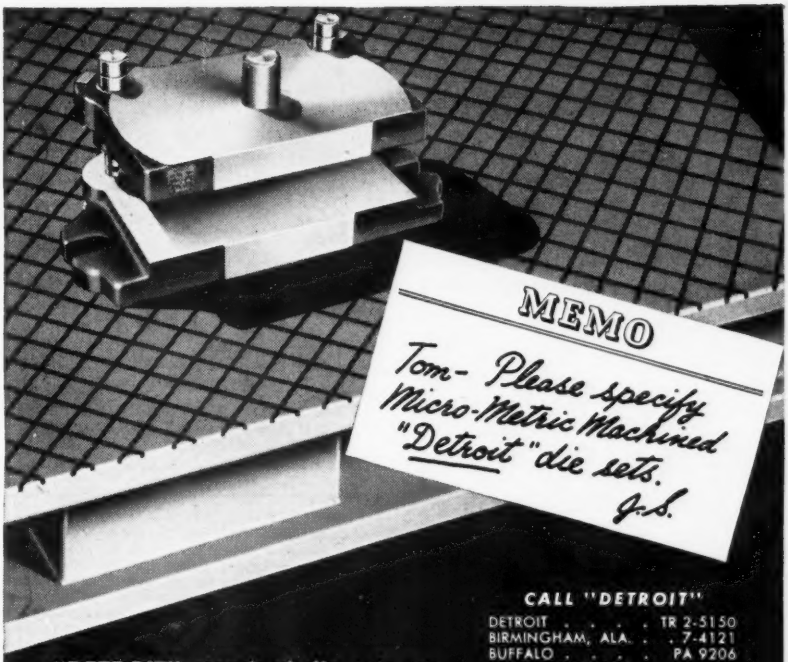
Automatic Screw Machine. An eight-page illustrated bulletin presenting information as to specifications, features, and construction details of the Tornos Type R10 High Speed Sliding Head Swiss Automatic Screw Machine and auxiliary attachments is available from Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.

"Beat Your Competition" is the title of a 16-page booklet issued by The Work-Factor Co., 366 Madison Ave., New York 17, N. Y., which discusses four basic ways to increase industrial production through aggressive control of indirect expenses; positive inventory control; full utilization of direct labor; and the most efficient use of production equipment and plant layout.

Impregnating Process. An eight-page illustrated bulletin on the Mogul Cast-Seal Impregnating Process has been published by Metallizing Company of America, 3520 W. Carroll Ave., Chicago 24, Ill. The bulletin fully explains the equipment used in this process which is claimed to provide a positive, economical method of eliminating casting porosity.

"Principles of Centerless Grinding." Cincinnati Grinders Inc., Cincinnati 9, Ohio, has announced a third printing of its booklet "Principles of Centerless Grinding," which has been brought up to date with new pictures. This booklet (G-503-2) is intended to explain the several principles presented by the centerless grinder which are entirely different from center-type grinding and which may not be so readily understood, and to also supply a basic working knowledge of the centerless method of grinding to those interested in the subject.

Dies and Tools. Lamina Dies & Tools, Inc., 14925 W. 11 Mile Rd., Berkley, Mich., now has available a 12-page two-color bulletin which illustrates and describes the company's complete facilities for precision die and tool manufacture, as well as its range of products, including progressive dies in steel and carbide; gear dies; lamination dies; master parts and short-run production parts; special retainers for interchangeable punches and dies; bronze plated guide bushings for use with all types of guide pins; precision die sets; milling, grinding and slotting machines, and other equipment. The latest price list (No. B-2) on guide pin bushings can be obtained with the bulletin.



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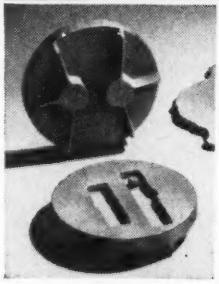

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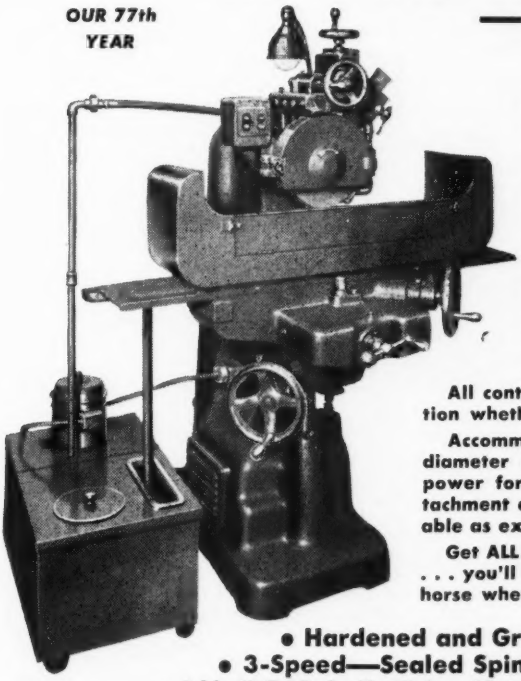

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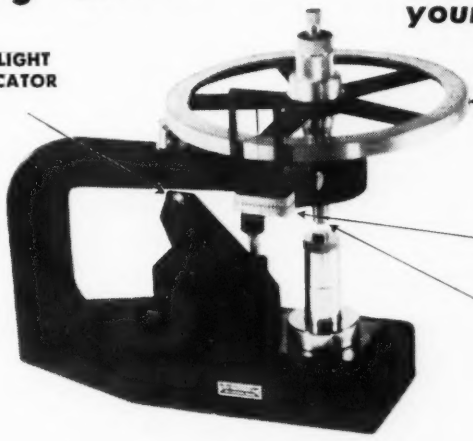

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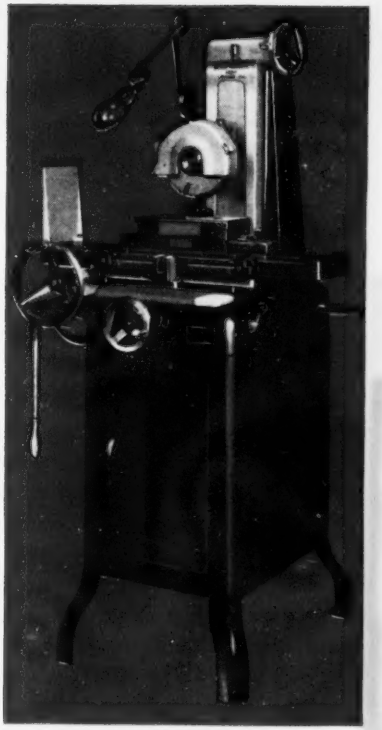

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Guest Editorial

By GEORGE S. BENSON
President, Harding College, Searcy, Arkansas

What About Big Business?

THE Communists and Socialists, and those among the so-called "liberals" who seek to establish the "Planned Economy" in America, have long used big business as their whipping boy. Of course all three groups know that their planned economy would necessitate, ultimately, the elimination of all private business. Thus much of their propaganda is designed to subtly create ill feeling toward the whole structure of American business by using big business as the focal point of their attack.

Some time ago I talked with a preacher who told me he came out of his university and entered the ministry infected with animosity toward big business, only to discover later how unjustified had been his attitude. Other people have frankly stated a belief that the country would be better off if the big corporations were forced to dissolve. These people have been reached by the campaign of misrepresentation and villification against business. It has been carried on unceasingly by the Leftwingers and quite often aided—surprisingly enough—by people in reputable institutions and on the staffs of publications and other mass communications media.

The Biggest

General Motors is the biggest corporation in America. As such it often is the special target of the Leftwing mudslingers. With every evil implication they can devise, they call attention to the big lump sum GM profits. Usually with slyness but sometimes openly, they suggest that this big sprawling industry is bleeding our country of wealth and preventing the people from obtaining their fair deserts.

The truth is that General Motors is the nation's biggest single producer of wealth. And since the welfare of every citizen is at least indirectly dependent on the measure of wealth produced in America, the company is making a substantial contribution to the general welfare. What GM and other big American industries mean to a great many people and to the economic health and growth of our nation would be dramatically revealed if our newspapers were to report tomorrow that the owners of General Motors (445,000 stockholders) had decided to liquidate their investment and close the business.

Millions Affected

The incomes of the 465,239 General Motors employees would stop. Approximately 2,000,000 persons—wives and children as well as the bread winners themselves—would be directly and stunningly affected by the stoppage of their income livelihood, insurance, pension benefits, and so on.

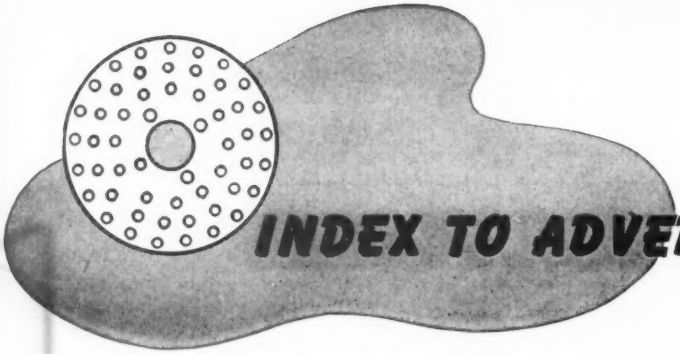
The GM yearly payroll of $1,809,218,043 would be abolished. Business in some 50 cities with GM establishments would be hard hit; some of their sales and service people would be laid off or terminated. Many of the tens of thousands of companies selling GM products would close. Indirect effects would spread widely. The business of more than 12,000 GM supplier industries scattered throughout the 48 states would be lost or seriously curtailed and the jobs and income of their several million employees would be eliminated or made shaky.

Should GM close up shop, the nation's national defense preparation would be critically stalled for a long time—for the company is the largest producer of materials for the armed services. Production of the new Walker tank; Allison and Sapphire jet engines, bombsights, Diesel engines, guns and planes, projectiles and a hundred other items being built by GM would stop. Vast research projects, out of which come further great boons to humanity, would be halted if GM quit.

Creator of Wealth

Hardest hit of all would be our local, state and Federal governments. For in 1950 General Motors paid in taxes to these government treasuries $1,119,000,000. And this total doesn't include $417,000,000 in sales and excise taxes collected by GM and delivered over to the Federal treasury. The total taxes of $1,536,000,000 paid by General Motors into the government treasuries could not be realized from any other source unless corresponding wealth were created—except by dipping further into the incomes of all the taxpayers—including you and me.

If GM were to cease operating, five years or longer would be required for its productive might and wealth-making capability to be developed by another company or number of companies. It probably would take much longer for its total value, to our nation and all 150,000,000 citizens, to be reestablished. Its value could never be reestablished unless we kept our present system under which GM grew into being.



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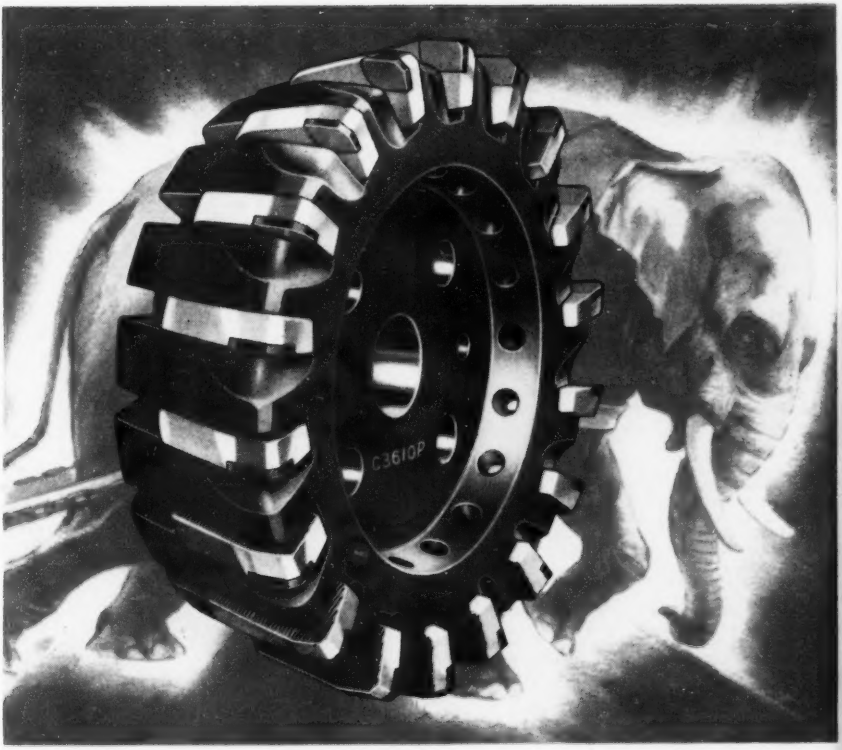

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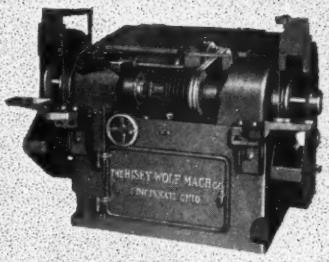

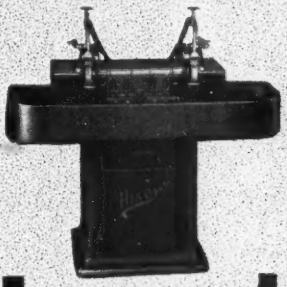

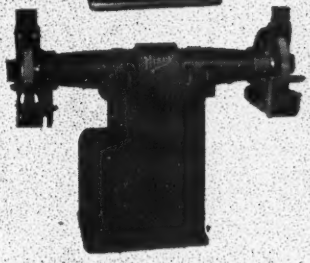

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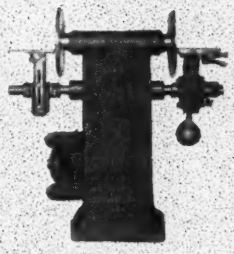

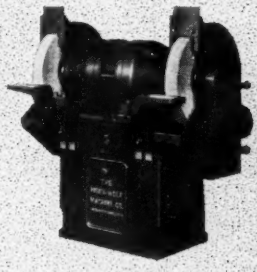

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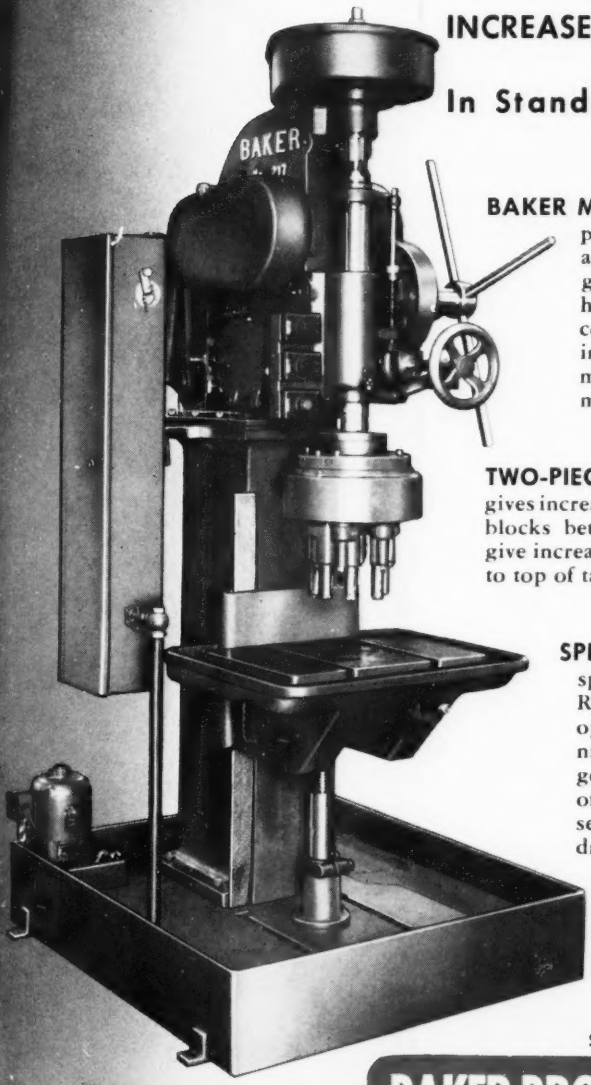

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